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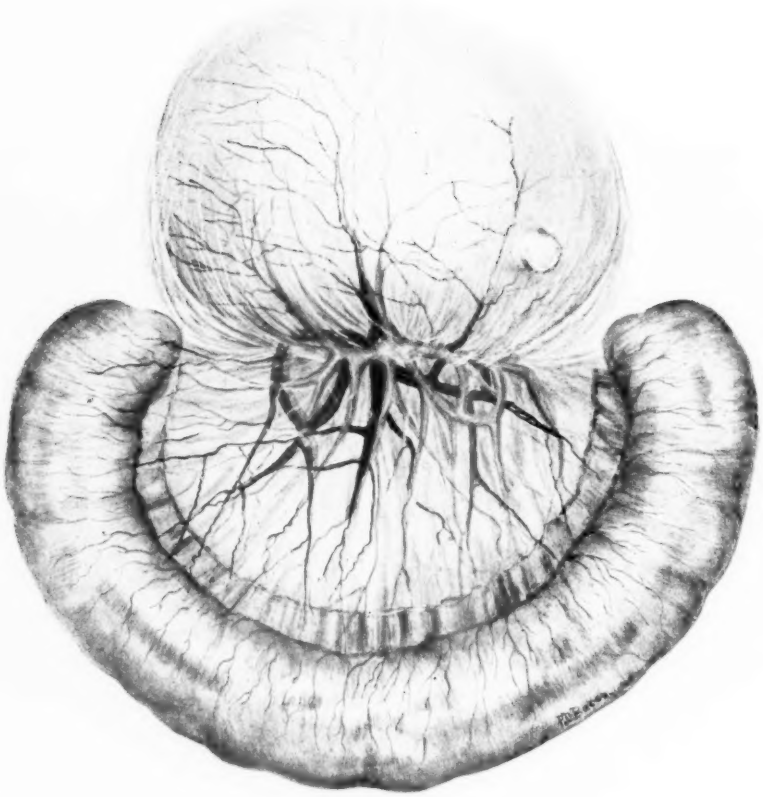

Mesenteric chyle cyst (author's case) partially enucleated from the mesentery.

SURGERY, GYNECOLOGY AND OBSTETRICS

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MESENTERIC CHYLE CYSTS[1]

BY EMANUEL FRIEND, M. D. CHICAGO
Attending Surgeon, Michael Reese Hospital; Assistant Attending Surgeon, Presbyterian Hospital

THE mesentery of the small intestine is composed of two layers of peritoneum which separate as they approach the intestine and form its peritoneal coat. Between these layers of the mesentery are found fat, lymph vessels, with accompanying blood-vessels, and mesenteric glands varying in number from 100 to 150. The lymphatic vessels, which are here called lacteals on account of the color of the fluid they carry, form by two plexuses in the villi of the small intestine, one plexus lying beneath the muscular coat and one beneath the mucous membrane. They anastomose freely and are accompanied by a very complete set of blood-vessels. The lacteals leave the intestines and extend about 1½ inches to the first series of glands; there they become fewer in number and larger in calibre and extend to a second series of larger glands situated on the primary arches of the arteries. From these again the efferent vessels of the third set of glands unite to form two or three trunks, or one trunk of large size, the truncus lymphaticus intestinalis. This joins with the right and left truncus lymphaticus lumbalis to form the receptaculum chyli of Pecquet.

The comparative rarity and the difficulty in diagnosis leads me to give a more or less complete résumé of the subject, and to report a case in hand. Where cysts of the mesentery have been reported from time to time, the true mesenteric chyle cyst is quite rare.

Mikulicz, and Kausch of Breslau, state in von Bergman's System of Surgery, p. 472, vol. 3, under the title of "Tumors of the Mesentery and Omentum," that "the greater number of primary tumors of the mesentery are cysts." Begouin has collected 123 cases of mesenteric cysts, and 33 of the solid tumors that may be classified into serous, hæmorrhagic, chylous, and echinococcus cysts, as well as dermoid.

Regarding the etiology of serous and hæmorrhagic forms we are still in the dark. The chylous form is due to a dilatation of a chyle vessel and its contents, fat or cholestrin. Chylous cysts may also occur in the retroperitoneal tissues.

Characteristic of all mesenteric cysts, according to Hahn, is the absence of epithelial structures, with the exception, of course, of dermoid cysts, which are congenital and contain epithelial structures. The mesenteric cysts are most common in the mesentery of the ileum, sometimes near the root, and at other times nearer the bowel, and may vary from the size of a walnut to that of an adult head. They are mostly unilocular; more seldom multilocular (echinococcus). Although the unilocular may occasionally have separating compartments, they may be single or multiple; the latter more especially in lymph cysts.

Symptomatology. As long as the cysts are small they give rise, as a rule, to no particular

[1] Read before the Chicago Surgical Society, February 2, 1912. (See discussion on p. 132).

symptoms, although as they grow one can by deep pressure elicit a tumor which may give rise to a tympanitic tone on percussion, due to an overlying distended loop of bowel, which however may become displaced as the tumor grows and as it nears the abdominal parietes the percussion sound becomes flat. Its growth is usually rapid although not necessarily a uniform one, as at times there seems to be a recession. It is usually situated in the region of the umbilicus, and a characteristic of the same is its free mobility. In case the origin of the same is from the root of the mesentery, or its growth toward the same, it may resemble a retroperitoneal tumor; or if it grows toward the bowel it may encircle the same and give rise to obstructive signs; although not necessarily so, as in a case operated by Mikulicz. The cyst encircled the bowel entirely with no obstructive symptoms. In the later stage the free mobility of the same may be interfered with by adhesions to neighboring structures, especially the anterior abdominal wall, which is quite rare in other growths of the mesentery.

Diagnosis. The diagnosis, consequently, rests upon the facts that we have a palpable, fluctuating, movable tumor which is to be differentiated from fluctuating masses in the omentum, pancreas, retroperitoneal tissues, ovarian cysts, or a localized sacked-off peritonitis, namely, tuberculous peritonitis or lipoma of the mesentery.

Mikulicz divides the treatment of same into three headings, namely: puncture, sewing the sac to the abdominal wall, and extirpation, and says that puncture is naturally out of the question in echinococcus and dermoid cysts, although Panas is supposed to have cured a case of echinococcus by this method. In other forms of mesenteric cysts puncture and aspiration were formerly done to a considerable extent. Begouin collected 54 cases in which puncture and aspiration were done without a fatality. Naturally it is difficult to make a diagnosis by this method of treatment, as one may have to deal with other forms of localized accumulations of fluid, and in addition the cases are more disposed to recurrence. Begouin found nine relapses in seventeen aspirations of cysts in the first three months. Especially prone to recurrence is the chyle cyst. Braqueheye, 47 out of 62 cases, namely, 75 per cent. Begouin speaks of the excellent results of sewing the sac to the abdominal wall, and opening the same either in one or two steps. His mortality tables show seven per cent deaths in this procedure, against sixty by extirpation.

Naturally these statistics go back some years, and I am inclined to say that unless some contra-indications exist at time of operation the consensus of opinion of the modern surgeon is to proceed to the radical extirpation of these cysts.

Bramann reports a case of tumor in the lower abdomen of the size of a child's head, firm and tense, fluctuating with tympanitic percussion sound but with absolute dullness directly over the highest part of the tumor. A diagnosis was difficult to make, and lay between echinococcus and dermoid cyst, hydronephrosis and pancreatic cyst. Laparotomy showed the tumor to be a densely filled cyst with glistening peritoneal covering and with many loops of small intestine adhering to its anterior surface. These loops of the small bowel did not have any mesentery; since it was completely obliterated by the cyst. The cyst contained seven to eight hundred cc. of a milky fluid which on careful examination was found to contain no epithelial or endothelial cells; many minute fat particles, cholestrin crystals, lymph corpuscles, and a few blood cells. It was coagulated by heat and acetic acid, and dissolved by ether, i. e., it showed all the characteristics of chyle. As to the pathogenesis, there was no pressure on the thoracic duct, no obstruction of this vessel due to chronic inflammation, no thrombosis of any of the big veins. Nevertheless, he says, he is forced to believe the origin of the cyst to be an obstruction to the outflow of the chyle. As to the location, it probably started in the receptaculum chyli, which is situated normally between the layers of the mesentery of the small intestines through obstruction of the thoracic duct. There is also the probability of a lymphangioma with cavernous degeneration. The lack of any epithelial or endothelial cells speaks against its origin from one or more lymph glands.

C. E. Congdon (Buffalo) reports a case that came under his observation in which the symptoms present were those of intestinal obstruction followed by peritonitis. An abdominal incision revealed the presence of a large cyst, or rather cystic enlargement and distension of the iliac mesentery, which was filled with a milky fluid and began about eighteen inches above the ileocæcal valve. It was ovoid, "dwindling toward the posterior mesenteric attachment into a wedge-shaped separation of the mesenteric layers." The ileum below was compressed into a white cord; above, distended. Recovery of patient.

History. The case under consideration was admitted to my service at the Michael Reese Hospital May 2, 1911, with the diagnosis of right inguinal hernia, and inasmuch as the patient did not complain of any further trouble he was not examined further by the admitting interne. His history was as follows: L. E. S., age 20; occupation, freight handler; nationality, Jewish; civil state, single.

Status Præsens: Patient comes to hospital because of right inguinal hernia. One year ago last April while lifting a seventy-pound weight patient experienced a sudden sharp pain in right inguinal region. The pain lasted for one hour and disappeared. Since that time he has experienced pain whenever he lifted heavy weights. He first noted a bulging in that region last December. For the last six months this has been gradually growing larger. The swelling is larger on lifting and coughing. Patient has worn a truss since January 1st.

Past Illnesses: Patient had gonorrhea three years ago, which lasted one month. Last December the glands in the inguinal region began to enlarge, and grew to the size of marbles; have decreased in size in the past two months. The swelling was not accompanied by pain and came on gradually. Six weeks ago the patient accidentally found a tumor in the median line of the abdomen below the level of the umbilicus. He thinks it has not changed in size since he first noticed it; it has not given rise to any pain. No urinary symptoms, no history of vomiting, fever, or jaundice; has not lost in weight.

Personal History: Does not smoke or drink alcoholics.

Family History: Negative.

Physical Examination: General appearance: A well nourished, ruddy complexioned, healthy appearing young male adult, sitting quietly in bed, apparently comfortable.

Head and Neck: Head and scalp, negative, except a few small glands palpable on both sides. No tenderness or rigidity.

Ears, negative.

Eyes, pupils equal, regular, react normally to light and accommodation. No extrinsic or intrinsic oculo-plegias.

Nose, negative.

Mouth, tongue coated, yellow; teeth in fair condition.

Throat, tonsils and pharynx, chronically inflamed.

Thorax: Well formed, well developed, symmetrical. Expansion fair and equal on both sides.

Heart: Sounds normal, no rubs, murmurs or irregularities; tones clear and distinct.

Lungs: Negative.

Spine: Negative.

Abdomen: Upon inspection a bulging is seen in the lower abdomen in median line just above the bladder region. Upon palpation this bulging is found to be a rather firm mass about the size of a cocoanut with a small nodule on the left side. Mass is movable from side to side and also in an upward and downward direction. It seems to be connected or encased in a fibrous band that extends from the pubes upward; no tenderness, œdema or ascites present.

Liver and Spine: Negative. Has a right-sided oblique inguinal hernia. Inguinal glands palpable.

Genitalia: Penis, urethral orifice bridged across by band of tissue at its middle, forming a blind anterior compartment and a patulous posterior urethra which is the true urethra. Both testicles normal in the scrotum.

Rectal Examination: A large, smooth, round, bulging mass that feels firm but is apparently fluctuating; is palpable about three-fourths of a finger's distance from the anus. The rectal wall is negative.

Extremities and reflexes: Negative.

Blood Examination:

Hæmoglobin, 90 per cent; White Blood Corpuscles, 15,000; Red Blood Corpuscles, 6,000,000.

Differential count:

Polymorphonuclears:	
Neutrophiles	63%
Eosinophiles	2%
Basophiles	0%
Transitional	5%
Mononuclears:	
Small	17%
Large	13%

Wasserman Reaction: Negative.

Urine: Negative.

A probable diagnosis of urachal cyst was made, and to aid in the diagnosis Dr. Irving Koll was asked to cystoscope the bladder, which was done and his report is as follows:

At the fundus of the bladder exactly in the median line was a dark area about the size of a quarter of a dollar. This suggested at once the possibility of a diverticulum, but upon attempting to pass the ureteral catheter into it, it bent upon itself as soon as it came into contact with the bladder wall. Superpubic pressure only tended to push the shadow downward without forcing out any fluid.

Except for a slight hyperæmia of the mucosa the remainder of the bladder was quite normal in appearance.

TABLE OF CASES

Reporter	*Where Reported*	*Sex*	*Age*	*Location*	*Operation*	*Origin*	*Size*	*Result*	*Remarks*
Weichselbaum	Virchow's Archiv. 1875. lxiv. p. 165	M	80		Incision, drainage	Between layers of mesentery	¾″ diam.	R	
Winniwarter	Med. Chir. Centralbl. p. 4	F	7 mo.	Near vertebral col.	Incision, drainage		3 liters	R	Probably congenital
Werth	Arch. f. Gynäk. xix. 1882	F	39	Umbilical region	Extirpation	Mesenteric glands	Child's head	R	
Mendes de Leo	Am. Jl. of Obstet. xxiv. 1881	F	27		Incision, drainage			R	Severe pain
Kuester	Ein Chir. Erkenntniss. Berlin. 1882	F	21		Extirpation	Between layers of mesentery	Adult's head	D	Peritonitis from wounding bowel
Killian	Berl. klin. Wchnschr. 1886. p. 407	F	61	Umbilical region	Incision, drainage	Distended ductus thorac	Large tumor	R	4,700 cc. chyle
W.	Berl. klin. Wchnschr. 1887. No. 23	M	31		Extirpation	Degenerated mesenteric gland	Kidney	R	500 cc. chyle
Pitman	Brit. Med. Jl. May 16, 1887	M	23		Postmortem	Mesentery of small bowel		D	Peritonitis due to ileus
Rokitansky	Lehrb. d. Pathology	M	36		Postmortem	Mesenteric gland		D	Multilocular
Virchow	Berl. klin. Wchnschr. Nov. 14, 1887	..	..		Postmortem			D	Multilocular
Fenominoff Wyenia and Petroff	London Med. Rec. Aug 20, 1888	F	26		Extirpation	Mesenteric gland	2 fists	R	2 tea cups fluid
Sohlein	Berl. klin. Wchnschr. 1889. p. 557	F	27	Umbilical region	Incision, drainage	Mesenteric gland		R	
Rasch	Trans. Obs. Soc. 1889. p. 311	F	21	Left and pubis (Median line)	Incision, drainage	Between layers of mesentery	6 pints	R	Cause: Rupture of chyle vessel (?)
Braman	Arch. f. klin. Chir. 1889. p. 201	M	63	Umbilical region	Incision, drainage	Receptaculum chyli	Child's head	R	700–800 cc.
Carson	Jl. Am. Med. Ass'n. 1890. May 10	M	42	Umbilical region	Incision, drainage		Adult's head	R	Wall very thick and hard
Fetherston	Austral. Med. Jl. 1890. p. 475	F	33	Pubis to 1 inch above umbilicus	Incision, drainage	Mesenteric gland	Adult's head	R	3 pints fluid
Gusserow	Charite Annalen. 1890. p. 613	F	25	Umbilical regino	Incision, drainage	Between layers of mesentery	Adult's head	R	2½ liters fluid
Tuffier	Bulletin soc. de chir. de Paris. 1892. p. 582	M	48	Umbilical region	Enucleation	Between layers of mesentery	Fœtal head	R	600 cc. chyle
Tuffier	Bulletin soc. de chir. de Paris. 1892. p. 582	F	12	Below umbilicus	Incision, drainage	Mesenteric gland		R	Multiple cysts all containing chyle
Epymann	Basler Inaug. Dissert. 1893	F	77			Thoracic duct		D	Died of endocarditis. Cysts contained inspissated chyle
Quinson	Centralbl. f. Chir. 1893. p. 111	F	20	Vertebral column	Incision, drainage			R	2 pints chyle
Wenning	Cincinnati Lancet Clinic. 1894. p. 653	F	56	Entire abdomen		Between layers of mesentery		D	Shock. Entire mesentery implicated
Hover	Trans. Ohio Med. Soc. 1895. p. 363	F	23	Umbilical region		Between layers of mes.	7″x3″	R	Pedunculated
Reynier	Gaz. des hôpitaux. 1895	F	31		Artificial anus	Mesentery	Fœtal head	D	Pedunculated. Peritonitis
Pagenstecker	Berl. klin. Wchnschr. 1895. No. 42	F	10		Extirpation	Mesentery	Apple	R	

Lynes	Annals of Surg. 1896. p. 605	M	19	Umbilical region and above	Removal	Mesentery	14 oz.	R	Chyle
Moynihan	Annals Surgery. 1897. p. 1	F	18	Umbilical region	Extirpation			R	
Moynihan	Annals Surgery. 1897. p. 1	M	7	Umbilical region and right	Extirpation		2 pints	D	Twisted pedicle of cyst
Eve	Lancet. 1897. p. 1246	M	11w.		Incision, drainage	Mesentery	Orange	D	Convulsions
Eve	Lancet. 1897. p. 1247	M	3½	Right lumbar region	Excision	Mesentery	32 oz.	D	Acute ileus
O'Connor	Brit. Med. Jl. 1897. p. 391	M	41	Between umbilicus and pubis	Incision, drainage	Between layers of mesentery	Cocoanut	R	
Benecke	Berl. klin. Wchnschr. 1897. p. 659	M	5		Extirpation	Mesentery	1, child's head 2, fist	D	2 cysts
Dalziel	Glasgow Med. Jl. 1898. p. 192	..	3		Extirpation	Mesentery	20 oz.	R	Acute volvulus
Spaeth	Münch. med. Wchnschr. 1898. p. 1083	F	39	Umbilicus and pubis	Incision, drainage	Mesentery	2 fists	R	
Beach	Boston Med. & Surg. Jl. 1898. p. 489	M	55	Right side to pubis	Incision, drainage	Between layers of mesentery	8 oz.	R	
Anifrejew	Centralbl. f. Chir. 1898. p. 920	..	26		Incision, drainage	Mesentery	400 cc.	R	
Ritter	Zeitschr. f. Heilk. 1900. bd xxi	M	2¼		Extirpation	Between layers of mesentery	Child's head	D	
Smoler	Beitr. zur. klin. Chir. 1901. p. 291	M	60	Above umbilicus	Incision, drainage	Mesenteric gland	Child's head	R	
Fawcett	Trans. Path. Soc. 1901–2. p. 406	F	3 mo	Partly in pelvis	None	Mesentery	2⅝″x1¾″	D	Too ill to be operated
Panas	Deutsch. Zeitsch. f. Chir. 1901-2. p. 137	M	45	Near umbilicus	Punctured	Mesentery	1 liter	R	
Peau	Deutsch. Zeitsch. f. Chir. 1901–2. p. 138	F	26	Umbilical region		Between layers of mesentery	10 liters	D	Peritonitis
St. Thomas Hosp. Report	1904. V. 31. p. 184	M	35	Umbilical region	Evacuated	Between layers of mesentery	30 oz.	R	
Speckert	Arch. f. klin. Chir. 1905. p. 998	F	29	Umbilical region	Extirpation	Mesentery	2½ liters	R	
Porter	Annals of Surgery. 1906. p. 380	M	22	Umbilical region	Extirpation	Mesentery and gland		D	Peritonitis
Evans	Am. Jl. of Anatomy. 1907. Aug.	..	..						
Brinsmade	Annals of Surgery. 1908. p. 565	M	32	To right of umbilicus	Ruptured, drainage	Degenerated mesenteric gland	Fœtal head	R	
Brinsmade	Annals of Surgery. 1908. p. 565	M	18	To right of umbilicus	Incision, drainage	Mesenteric gland	10 oz.	R	Omentum adherent to cyst
Congdon	Am. Jl. of Obst. 1909. Nov.	..	6	Umbilical region	Incision, drainage	Mesentery	2 quarts	R	
Beefraze	Hygieia. 1910. p. 676	M	19		Incision, drainage		4,300 cc.	R	Multiple cysts
Burrows	Proc. Royal So. Med. 1910. p. 165	..	5		Partial excision, drainage	Mesenteric gland	15 oz.	D	Peritonitis
Shattock	Proc. Royal So. Med. 1910. p. 98	M	22					D	Peritonitis. Contents chyle
Key and Wilkinson	Amer. Surgery. July, 1911	F	8	Left of umbilicus	Excision with resection of bowel	Between layers of mesentery	Cocoanut	R	Multilocular

Will also say that although numerous attempts to elicit mobility of the tumor were made we failed until the patient was put under the anæsthetic for the cystoscopic examination, when it changed its position and we found it then in the right hypochondriac region.

Operation. May 10, 1911. Gas-ether anæsthesia given by Dr. Seegar, Dr. Jones assisting at the operation.

After the usual preliminary preparation, a median incision was made from the umbilicus to pubis. Upon opening the peritoneum the tumor mass was seen to be in the mesentery of the ileum; the mass was delivered through the incision and the intestines covered with lap sponges. The anterior or overlying peritoneum covering the tumor was incised in a semi-circle, reflected backward and the tumor mass carefully dissected out. The large mesenteric vessels were carefully preserved. In this dissection the capsule of the tumor was accidentally ruptured and some of the contents, consisting of a grayish yellow, caseous appearing matter was expelled and promptly sponged away. After the mass was delivered bleeding vessels were ligated with plain gut, care being taken not to include the main vessels. The cut edges of the mesentery were brought together with plain catgut. Abdominal wall was then closed with double row of plain catgut, first row including peritoneum and posterior rectus fascia. Skin edges approximated with waxed silk. Patient left operating room in good condition and made an uneventful recovery.

Pathology: The examination was made by Drs. Jobling and Strouse of the Pathological Department. Size about that of a cocoanut; walls thick and leathery. Histopathology showed the same composed of layers of fibrous tissue containing a few small blood-vessels, some of which were surrounded by round cells. The interior wall of the cyst not covered by a lining membrane.

Contents: Was of two types. Firstly, an almost colorless thin fluid; secondly, a reddish-brown, thick, fatty substance of about the consistency of cottage cheese. On burning a small portion the odor of fried fat was very strong. Microscopically, the material was composed almost entirely of fine fat globules taking easily Soudan III stain. Some few blood cells were also seen; but epithelial, pus or other cells were lacking. The nodule spoken of consisted of a dense mass of fibrous tissue.

Many observers believe that these cyst formations are due to degenerated obstructive conditions in the lymph gland wherein the afferent vessel may be patulous; the efferent vessel is obstructed by this gland and the fluid goes on accumulating and cystic dilatation of the efferent vessel is brought about. The case which I reported had, as the history sheet and the illustration show, a nodule which was situated in the cyst wall, which was probably a degenerated lymph gland, corresponding to similar cases reported by Werth and Martin (Brinsmade).

I have collected fifty-two true chyle cysts of the mesentery, dating from 1875 to 1912, although the disease was first described by Rokitansky in 1842. From this series I have found that they occur at all ages from early childhood to very late in life. In size they varied from ¾-inch in diameter to an adult head. The great majority presented themselves in the umbilical region or between the umbilicus and the pubes. Of the twenty-five cases treated by incision and drainage there were twenty-three recoveries and two deaths, and amongst eighteen cases treated by extirpation there were twelve recoveries and six deaths. One case in which an artificial anus was established died.

THE PATHOGENESIS, ANATOMY, AND CURE OF PROLAPSE OF THE RECTUM[1]

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INTRODUCTION

THE malady conventionally known as "Prolapse of the Rectum" has always occupied a prominent place in medical literature. The reason for this prominence is obvious; both our understanding of the disease and the methods thus far advocated for its relief are unsatisfactory. This dissatisfaction has stimulated me, as it has so many others, to study this disease more closely. A fairly extensive hospital service, augmented by the courtesy of many colleagues, has given me the abundant opportunity which I desired. As a result of these observations, I believe I am now able to formulate a satisfactory and perfectly demonstrable pathological anatomy of prolapse of the rectum; and based on this anatomy, I am also enabled to suggest an operation which in my hands has raised the percentage of cures from practically nil to one hundred.

My theory and operation are based upon the demonstrable fact, that prolapse of the rectum is a hernia; and that in all its features, etiological, pathological, clinical, and therapeutic, it conforms to the well recognized principles of hernia in other parts of the body. Inasmuch as my ideas on this subject may, therefore, appear somewhat unorthodox, I shall elucidate my subject in greater detail than usual. It is for this reason, I plead tolerance for any apparent prolixity of this paper.

NOMENCLATURE

The term "Prolapse of the Rectum" is to my mind a misnomer, because the anatomical rectum is not prolapsed, except in the very last stage of the disease. Nor should those maladies grouped under the generic name of "Intussusception" be included under the heading of this disease. Intussusception, as is well known, is due to a prolapse of a superior portion of the bowel, frequently of the ileocœcal portion, sometimes even of the small intestine. On superficial examination such an intussusception simulates a so-called prolapse of the rectum; but neither in symptomatology, nor in pathology, nor in therapy have they anything in common. At best they may be termed prolapses *out of* the rectum, but not *of* the rectum. This distinction may appear obvious, but it is surprising that most American textbooks on rectal diseases, and many special papers on the subject, still maintain this identity.

Broadly speaking, the disease we are considering is characterized primarily by a protrusion of the mucous membrane of the rectum outside of the anus. Experience has taught us, however, that granting even the existence of this essential characteristic, there may be present two entirely different maladies.

In the first there is a protrusion of the mucous coat only, while the remaining coats of the rectum are in normal relationship with the surrounding structures. This should be termed a "*Prolapse of the mucous membrane of the rectum.*" Incorrectly it has received the name "*Prolapse of the Anus.*" It is manifest that the anus, being merely a hole, cannot prolapse.

In the second, the mucous membrane is in normal relationship with the other coats, but the entire rectum (with certain restrictions in phraseology) has been protruded out of the anus, and has lost its normal relationship to the surrounding structures. This is the form which has, by the way, also incorrectly been termed "*Prolapse of the Rectum,*" and is the one which forms the principal theme of this paper. In view of the fact that the term "Prolapse of the Rectum" has become a convention, we will continue to use it, under protest, in want of a better.

True prolapse of the rectum, in turn, has numerous subdivisions, which, however, will be discussed under the heading of Pathological Anatomy.

[1] Read before the New York State Medical Society, April 16, 1912.

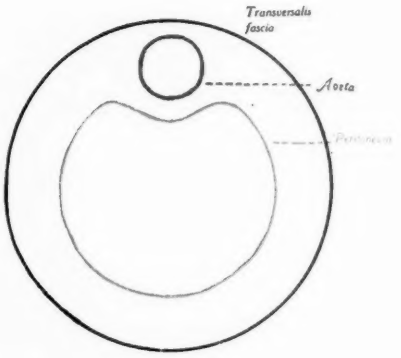

Fig 1

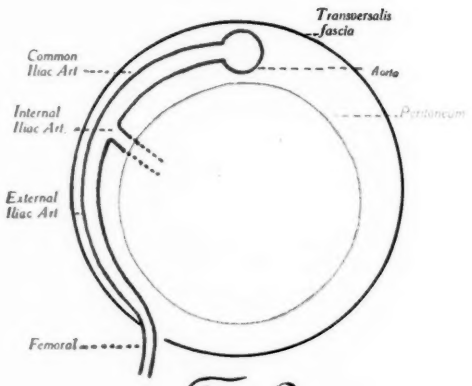

Fig. 2

PATHOGENESIS AND PATHOLOGICAL ANATOMY

1. The oldest, and I might add, the least probable theory as to the pathogenesis of a true prolapse of the rectum is that of Esmarch.[1] According to this author, the primary cause is an inflammation of the mucous membrane of the rectum, a sort of catarrh. The inflammation is then presumed to spread to the other coats, and ultimately involves even the supporting structures of the rectum. This theory is not tenable for several reasons; but principally because to our knowledge inflammatory conditions of the mucous membrane of the rectum, no matter how intense, are not followed by prolapses of the rectum. When we do have an inflammation of the mucous membrane, as so frequently seen in infants and young children, there follows at best a prolapse of the mucous membrane; but this, in turn, is not followed by a true prolapse of the rectum. It appears to me very probable that Esmarch has taken effect for cause, since we know that a catarrhal inflammation is only a late manifestation of prolapse of the rectum.

2. Jeannel,[2] as near as I could understand it, explains rectal prolapses as occurring in consequence of a ptosis of the small intestine, which allows them to sink into the cul de sac of Douglas; by their weight, the intestines cause a pressure atrophy of the levator ani, which ultimately gives way, and allows a prolapse. This theory, while it goes somewhat nearer to the root of the trouble, is also untenable, because, as a rule, we do not find this pressure atrophy. The animal experiments which were carried out in order to prove this theory were so mutilating as to invalidate their significance.

3. The prevailing theory at present, and the one that I believe to be correct, is that prolapse of the rectum is a hernia, in the true sense of the word. This theory has arisen largely as a result of the anatomical studies of Waldeyer,[3] and has been confirmed by the clinical researches of Ludloff,[4, 5] Zuckerkandl,[6] Napalkow,[7] Dix,[8] and others.

In order to fully appreciate this theory, a substantial knowledge of the anatomy of the pelvis and its contents is essential. In addition there are, however, certain simple, fundamental principles, to which attention should be called.

In a paper [9] read before the Surgical Section of the N. Y. Academy of Medicine, Dec. 1, 1911, I explained in detail my conception of a hernia, and pointed out the paramount importance of the transversalis fascia in relation

[1] Esmarch. Deutsche Chirurgie. Lief. 48. Die Krankheiten des Mastdarmes und des Afters.

[2] Jeannel. Gazzette Hebdomadaire. May 24, 1899.

[3] Waldeyer. Das Becken. Bonn. 1899.

[4] Ludloff. Archiv. f. klin. Chir., lix, 447.

[5] Ludloff. Archiv. f. klin. Chir., lx, 717.

[6] Zuckerkandl. Deutsch. Zeitsch. f. Chir., xxxi.

[7] Napalkow. Chirurgie, x.

[8] Dix. Zur Pathogenese des Rectumprolapses. Inaug. Diss. Bonn 1904.

[9] Moschcowitz. Medical Record, December 30 ,1911.

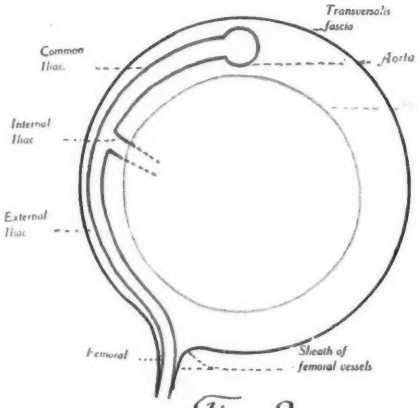

Fig. 3

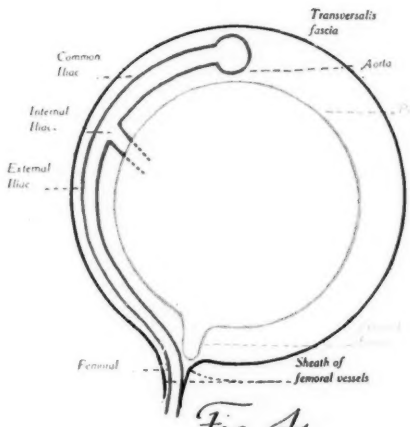

Fig. 4

to hernia. As a knowledge of this fascia is also essential to the proper understanding of prolapse of the rectum, I shall recapitulate briefly the anatomy of this structure; particularly its relationship to the various structures which pass through it.

1. The entire abdominal parietes, front, sides, top and bottom, are lined by peritoneum.

2. External to the peritoneum there is everywhere a layer of fascia. This fascia has received different names in different parts of the abdomen, e. g., transversalis, pelvic, iliac, diaphragmatic, etc. If traced, however, it will be found that these are merely parts of one continuous layer.

3. All the large vessels in the abdomen and all the viscera of the abdomen *lie upon* the transversalis fascia, and are *covered by* the peritoneum. I regard this fact of the greatest importance in the proper understanding of the anatomy of hernia in general, and of prolapse of the rectum in particular. For this reason I shall discuss this subject in detail. In order to elucidate my subject, I will explain first the pathogenesis of an ordinary hernia; and for the sake of simplicity, I have selected the femoral variety.

Fig. 1 represents schematically a cross-section of the abdomen at any point above the bifurcation of the aorta.

At the point of exit of the femoral vessels into the thigh, the diagram is modified as in Fig. 2.

If Fig. 2 is closely examined, it will be seen that, at the point where the external iliac vessels lose their relationship to the peritoneum, there is an opening in the transversalis fascia, in order to permit the escape of these vessels from the abdomen.

As a matter of fact, however, careful dissection will show, that the transversalis fascia is continued downward for a certain distance upon the vessels, gradually becoming thinner and thinner, blending finally with the vessel wall itself. To be exact therefore Fig. 2 should be modified as in Fig. 3.

In certain parts these perivascular prolongations of the transversalis fascia have been carefully studied, are well marked, and indeed have received special names. I mention as such the prolongation upon the spermatic vessels, which is called the "infundibuliform fascia," and the prolongation upon the femoral vessels, which has received the name of "sheath of the femoral vessels."

Although the importance of the transversalis fascia has not, I believe, been estimated at its true worth, it is an established fact that this fascia is, as a rule, strong enough to retain the viscera within the abdomen. It is, however, not strong enough to do so at certain definite anatomical points; and it is at these points, and at these points only, that we find herniæ. A little reflection will show that herniæ occur only where blood-vessels or viscera make their exit normally. In other

Fig. 5

Fig. 6

words, it is very apparent that these weak anatomical points must be the attenuated perivascular or perivisceral projections of the transversalis fascia. Every hernia, e. g., femoral hernia, can therefore be diagrammatically presented as in Fig. 4.

There is no doubt, though it never was stated before, that a similar arrangement holds true for every blood-vessel that escapes from the abdomen to the periphery, as for instance, the obturator or sciatic arteries. Likewise there exists a similar hiatus in the transversalis fascia, whenever a viscus, e. g., the rectum or the vagina, escapes from the abdomen to the periphery, and is accompanied by a similar prolongation of the transversalis fascia.

Let us now note how a knowledge of these facts assists us in explaining the pathogenesis of prolapse of the rectum.

Fig. 5 represents diagrammatically a latero-vertical section of the abdomen, at the point where the large intestine escapes from the abdomen, and becomes rectum.

Fig. 6 represents the same condition in an antero-posterior section of the pelvis.

Both of these sections are intended to present the hole in the transversalis fascia, through which the rectum escapes from the abdomen.

Nature, however, adds a nicer finish to this hole; and just as it has been found that the transversalis fascia sends a downward prolongation upon the spermatic, femoral and other vessels, we also find that the pelvic part of the transversalis fascia sends a similar outward prolongation upon the rectum, upon which it gradually becomes lost. To be exact therefore Fig. 6 should be modified, so as to appear as in Fig. 7.

If we now compare Fig. 7 with Fig. 3, we will note the close similarity of the two.

As in other herniæ, the subsequent development of a prolapse of the rectum is not easy of explanation. It is well known, that there exist two theories for the origin of herniæ. First, that which regards the sac as a congenital malformation, and second, that which regards the defect in the transversalis fascia as the *causa peccans*. We find, in truth, that both these theories are also applicable to prolapse of the rectum.

In early embryological life the peritoneum reaches downward almost to the perineum. Later it becomes shut off, and recedes higher and higher. It is quite conceivable, that if this shutting-off process stops early, the cul de sac of Douglas will be deeper than is normal. This affords a substantial basis for the congenital or saccular theory of rectal prolapse.

The congenital or saccular theory of hernia has never appealed to me strongly, except for those cases in which there is no doubt of the congenital nature of the sac; and I am more inclined to the second theory. In the paper already referred to (Medical Record, Dec. 30, 1911) I have pointed out my

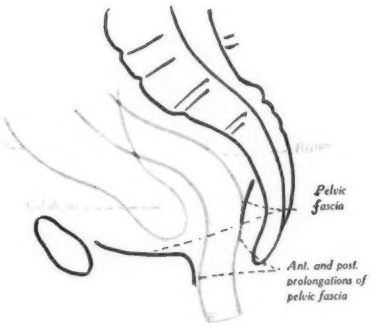

Fig. 7

Fig. 8

conception of a hernia. In this I stated, first, that there must be a defect in the transversalis fascia whenever a vessel or viscus escapes from the abdomen to the periphery; and second, that at the location of this defect, there must be an eversion of the transversalis fascia which is continued downward and outward for some distance upon the vessel or viscus, gradually becoming thinner and thinner, and is finally lost upon it. The conditions being thus favorable, it requires only some added factor for the production of a hernia; namely, some increase in the intra-abdominal pressure, such as straining (secondary to heavy work, parturition, habitual constipation, coughing, phimosis, vesical calculi, stricture of the urethra, etc.), which will drive the peritoneum into the sheath formed by the outward prolongation of the transversalis or pelvic fascia.

When we consider all the points that I have just stated, I believe Fig. 8 would be a diagrammatic but nevertheless true representation of a prolapse of the rectum in its very incipiency.

I need hardly say, that I have no proof of this state, and that I argue merely from analogy with other herniæ, and from the anatomy of the parts in question.

The subsequent development of the prolapse is most interesting, and depends upon definite anatomical facts, which must be known, in order that the pathological anatomy of prolapse of the rectum be intelligible. It is important for us to know:

1. That the peritoneum covering the anterior surface of the rectum is intimately adherent to it. This is important, because it explains why, in spite of the fact that prolapse of the rectum is a hernia, we do not have a distinct and separable peritoneal sac. In other words, this hernia is exactly analogous to the so-called "hernie par glissement."

2. That the under surface of the levator ani is also covered by a very dense fascia; this, together with the other component parts of the perineal body, prevents the progress of the hernia in a downward direction.

For a short while the muscular wall of the rectum itself prevents the further growth of the hernia; but this is comparatively weak. Its resistance is limited, and it readily gives way to the persistent intra-abdominal pressure, so that the next step in the formation of the prolapse must be diagrammatically as illustrated in Fig. 9.

When this stage has been reached, there is for a while nothing to prevent the subsequent growth of the prolapse. The prolapse increases mainly in a posterior direction, until it is arrested, first by the posterior wall of the rectum, and when this ceases to give support, by the underlying sacrum and coccyx. So that, at this stage, Fig. 10 would be a true presentation of the prolapse.

But the intra-abdominal pressure still continues. The prolapse, as was shown in the last diagram (Fig. 10) can not extend backward, being prevented by the sacrum and

Fig. 9

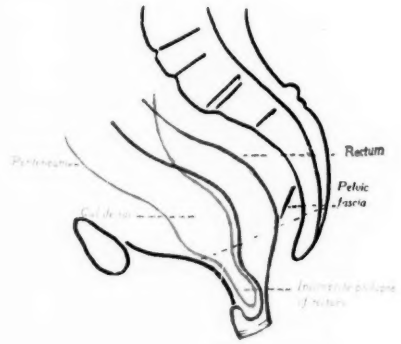

Fig. 10

coccyx; it must therefore change its course, and sliding along the posterior wall of the rectum, it extends at first in a downward and forward direction, and finally backward toward the anus. Ultimately, this is also forced, and the prolapse appears externally. This stage is represented in Fig. 11.

I am in the fortunate position of having, by a peculiar circumstance, come across two cases of prolapse of the rectum, at what may be considered the stage represented in Fig. 10.

During my interneship, at the N. Y. German Hospital in 1893, by the courtesy of Dr. Willy Meyer, I removed the coccyx in a case of supposed coccygodynia. The wound healed by primary union. Promptly upon his discharge from the hospital, the patient noticed a bulging in the scar. The bulging increased, and when I next saw him, he had in the coccygeal region a perfect hernia, with all its characteristics. He never consented to its radical cure. The more I think of this case, the more I conclude, that the symptoms complained of by this patient were due, not to a coccygodynia, but to an incipient prolapse of the rectum.

For my second case I am greatly indebted to Dr. Chas. H. Peck, who successfully operated upon it, by the method to be later described.

Mrs. M. W., 44 years of age, was admitted to the Roosevelt Hospital on November 7, 1911, suffering from a hernia in the median line posteriorly, just below the sacrum, in the cicatrix of an operation performed fourteen months previously at another hospital, for excision of the coccyx.

The protrusion was marked on standing or sitting upright, and examination indicated that the small intestine, pushing the rectum before it, formed the contents of the hernia. The hernial aperture easily admitted three fingers. The sac was evidently continuous with the cul de sac of Douglas, and the procedure of obliteration of the cul de sac of Douglas, recommended by Dr. Moschcowitz was decided upon as the first step in the attempt to cure the hernia.

The operation was performed on November 8, 1911. Through a median laparotomy wound, the cul de sac, which was unusually deep and the bottom of which formed the hernial sac, was obliterated by successive tiers of catgut sutures as high as the middle of the body of the uterus.

No attempt was made to close the hernial ring at this time. On November 21, the hernial ring was closed by a second operation. Before this was done the patient was allowed to stand up, and it was found that the protrusion of the hernia had entirely disappeared, though the aperture was still open, i. e., the small intestines no longer descended low in the pelvis and forced the rectum through the aperture. Closure of the aperture was effected with difficulty, and not very satisfactorily; but on discharge from the hospital on December 16th, the hernia seemed completely cured.

The obliteration of the cul de sac, and thus of the hernial sac, seemed to me the keynote of the success of the operation.

I look upon both of these cases as prolapses of the rectum; but the coccyx, having been extirpated, was not present to withstand the progressive growth of the prolapse, as shown in Fig. 10. In the absence of the coccyx, the posterior wall of the rectum also gave way,

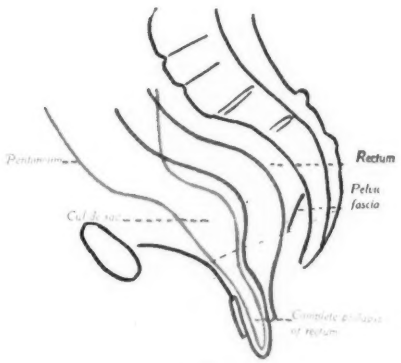

Fig 11

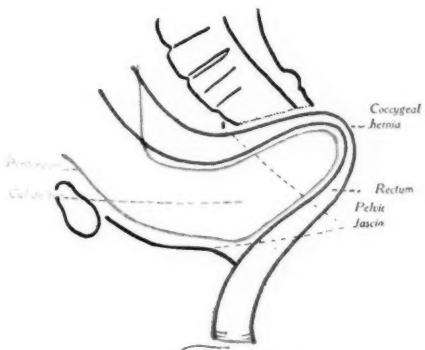

Fig. 12

and appeared as a bulging in the scar. According to my interpretation, Fig. 12 presents the disease at this very peculiar stage.

Thus far, as shown in the diagrams, only the anterior wall of the rectum is involved. The lowermost part of the rectum being firmly fixed, the prolapse can not increase at its expense; therefore, in the subsequent growth, it can enlarge only by drawing-in first, the two lateral, and finally also the posterior walls, until the further drawing-in of the bowel is prevented by the firm fixation of the organ.

This has a very important bearing upon the physical signs of complete prolapse, and explains why even the largest prolapses never exceed five to six inches in length.

With these data, we are now in a position to explain why the term "Prolapse of the Rectum" is a misnomer. All the walls of the rectum prolapse only in the very last stage, and even then are only drawn down by the anterior wall.

In order to complete the nomenclature according to my interpretation, I suggest the following subdivisions:

1. *Incipient prolapse of the rectum*, illustrated in Fig. 8.

2. *Partial prolapse of the rectum*, illustrated in Fig. 9.

3. *Incomplete prolapse of the rectum*, illustrated in Fig. 10.

4. *Complete prolapse of the rectum*, illustrated in Fig. 11.

This corresponds to the classification of inguinal hernia, in which we are also wont to distinguish between a bubonocele and a scrotal hernia.

There is not the slightest doubt in my mind that all of these actually exist, although as a rule, the earliest stages can not be demonstrated. Unlike inguinal hernia, the rectal protrusion in its early stages is invisible, and the patient ascribes his symptoms as due to hæmorrhoids, habitual constipation, etc. If a physician is consulted the true nature of the malady is overlooked. I believe that in the course of time these conditions will be recognized; when this occurs, the prognosis and treatment of these cases will be affected materially.

SYMPTOMS AND PHYSICAL SIGNS

Primarily, I wish to mention that I intend to describe only the symptoms appertaining to true prolapse of the rectum; other conditions will be discussed only when a question of differential diagnosis arises.

The presence of a mass protruding from the rectum is manifestly the cardinal symptom. This is frequently accompanied by a discharge of pus and blood. The patient avers that the protrusion is of long standing, and that it had ceased growing after it had attained its present dimensions. At first the patient is able to reduce the protrusion voluntarily (action of the levator ani) but in the course of time reduction became possible manually only.

In neglected cases, and those of very long

duration, the sphincters are so stretched that the prolapse does not stay up even when reduced, and patients suffer, without ever attempting to reduce it. (In rare instances the prolapse becomes incarcerated, with all the symptoms of incarceration; of these, however, I will not speak at the present time.)

On inspection there is found a mass protruding from the anus; usually of an inverted cone shape, and hardly ever exceeding a length of five to six inches. (In reality, the mass is twice that length, for the protrusion is made up of two cylinders.) Its surface is covered by mucous membrane which varies in appearance; it may be normal, or greatly inflamed and thickened; or covered by ulcerations, which bleed very readily, or by a diphtheritic membrane. The mucous membrane of the inner cylinder is normal, or at most slightly hyperæmic.

Upon the apex of this protrusion there is an opening which is directed backward. If one would make two lateral incisions, exactly from the center of this opening, the anterior part would exceed the posterior by at least three to one. This must necessarily be so if the explanation of the pathological anatomy I have given is true.

The anterior half gives very frequently a tympanitic note on percussion, because it is usually filled by small intestines; the posterior half is dull on percussion. These symptoms are not present in so-called prolapse of the anus, nor in invaginations.

If the case has been neglected, has not been operated upon before, invagination of the finger between the sphincter and the anterior surface of the prolapse will be prevented by a sulcus of about an inch in depth (see Fig. 11). In prolapse of the anus there is no such sulcus, because the prolapse begins at the muco-cutaneous junction; while in intussusceptions the sulcus is so deep that it can never be reached by the examining finger.

Unless incarcerated (very rare) the entire prolapse can be reduced, either by the patient's contracting the levator ani, or it can be replaced manually. Sometimes gurgling is noted when the prolapse is being reduced, on account of the small intestines contained in the anterior half.

When the prolapse is reduced, the following physical signs are present. The rectum imparts a sensation of fullness to the examining finger, because the normal outlines are obliterated, and because of the laxity of the tissues. The anterior surface gives as distinct an impulse on coughing as any hernia. To prove that rectal prolapse is a hernia, I have demonstrated a very interesting phenomenon. I have found that after the prolapse is reduced, if the finger is introduced along the anterior wall, it requires but the slightest pressure of the fingers to keep it reduced, no matter how much the patient strains. If the finger is now held against the posterior surface, no amount of pressure exerted will prevent the prolapse from coming down.

The tone of the sphincter ani varies; in some cases its tone is very good, and its voluntary contractions are very readily elicited. In other cases, the tone is entirely lost, its fibres are stretched to a maximum, easily permitting the introduction of the entire fist.

TREATMENT

It is a well known axiom in medicine that the more remedies there are suggested for the cure of a malady, the less the likelihood of the efficacy of any particular one. This is eminently true in regard to the immense number of measures that have been recommended for rectal prolapse. The following are the more important procedures employed or suggested:

A. *Nonoperative methods.*

I. Medication and topical applications to cure the catarrh. This is doubtless of value in cases of so-called prolapse of the anus, but certainly can not be of permanent benefit in cases of true prolapse of the rectum.

II. Electricity.

III. Submucous injections of astringents, or of carbolic acid, strychnine, ergot, tannic acid, etc.

IV. Mechanical supports.

V. Massage after the method of Thure Brand. Good results have been reported from this measure. The use of massage is founded on the theory that it strengthens the muscular wall of the rectum and the levator ani. It is based on the misconception, that the primary

cause of prolapse of the rectum is a weakness of these structures. Furthermore, the favorable results reported are mostly in children, in whom true rectal prolapses are rare.

B. *Operative methods.*

I. Methods the aim of which is to cause a narrowing of the anal aperture, and more or less of the adjoining rectum.

1. Cauterization of the rectal mucosa with the actual cautery, nitric or sulphuric acid, or chloride of zinc.

2. Elliptical resections of the mucous membrane of the rectum, with subsequent suture. Delorme.[1]

3. Wedge-shaped resection of the posterior wall of the rectum, including more or less of the sphincter, with subsequent suture, has been practiced by Dieffenbach,[2] and was subsequently revived by Roberts.[3]

4. Thiersch[4] introduces subcutaneously a ring of silver wire, in the region of the sphincter, which is supposed to heal in, and act as a support.

5. Gersuny's[5] method of twisting the rectum is too well known to require lengthy description.

6. Paraffin injections in the region of the sphincter have been proposed also by Gersuny.

7. Bier[6] removes the entire mucosa from the outer cylinder of the rectal prolapse. The submucous structures are then reefed together into a welt, thereby strengthening the external sphincter; finally the mucosa is sutured to the integument.

It does not require lengthy argument to show the fallacy of these methods. At best, they merely act as a sort of a natural pessary, and a very poor one at that. Sooner or later the prolapse must recur. The good results that have been reported from the application of any of these methods can be accounted for by too short a period of observation.

II. *Methods devised to strengthen the natural supports of the rectum.* These methods are closely related to the preceding group; the difference being, that the procedures are performed upon the bowel, at a somewhat higher level.

1. The method of Ott,[7] who performs what is practically an inverted perineal plastic.

2. Hoffmann's[8] method, also recommended by Poppert.[9] An "H"-shaped incision is made behind the anus; the resulting side to side denudation is then stretched so as to form an antero-posterior denudation, which is then closed by deep and superficial sutures. In view of the fact that Hoffmann, in his article, shows an excellent conception of the pathology and pathogenesis of prolapse of the rectum, it is somewhat surprising that he nevertheless devises and recommends an obviously inefficient method for its cure.

3. Beresnegowsky[10] attempts to build up a new support for the rectum, by a muscle plastic from the two glutei.

4. Napalkow[11] was the first to recognize the importance of the deep structures. He makes a transverse incision in front of the anus, and works his way upward to the peritoneum; this he closes off and finally sutures the two levators together; if the latter are too lax they are shortened by reefing sutures.

None of the methods of this group can be looked upon as curative, because they do not take into consideration the pathology of prolapse of the rectum. I except from this criticism the method of Napalkow. The objections to Napalkow's method, however, are, that he overlooks the important fact that prolapse of the rectum is a sliding hernia, and that therefore there is no hernial sac which can be resected and extirpated; furthermore, it is exceedingly difficult, if not impossible, to suture together, at such great depth, the two levators and the upper layer of the pelvic fascia with the requisite care and exactness.

III. *Methods which pay particular attention to the fixation apparatus of the rectum.*

1. Methods which attack the problem below the level of the levator ani.

[1] Delorme. Bull. de Soc. de Chir. de Paris, 1901, No. 24.

[2] Dieffenbach. Die Operative Chirurgie, Leipzig, 1848.

[3] Roberts. Annals of Surgery, xi, page 255.

[4] Thiersch. (Goldmann. Über Mastdarmvorfall, etc. Inaug. Diss. Strassburg, 1892.) (Original not obtainable.)

[5] Gersuny. Zentralbl. f. Chir., 1893.

[6] Bier. Deutsche med. Wchnsch., 1904, No. 11.

[7] Ott. Jr. Geb. und Gyn., 1900.

[8] Hoffmann. Zentralbl. f. Chir., 1905, 905, and 1906, 667.

[9] Poppert. Deutsche Zeitsch. f. Chir., c, 327.

[10] Beresnegowsky. Archiv. f. klin. Chir., xc, 627.

[11] Napalkow. Chirurgie, x.

(*a*) Verneuil[1] resects the coccyx and sutures the rectum to the integument.

(*b*) Gerard Marchant[2] also resects the coccyx; he then infolds the rectum by longitudinal sutures, and finally fastens it to the lower end of the sacrum. This operation was modified by Koenig, who passes the sutures through holes drilled through the sacrum.

(*c*) Ekehorn[3] reduces the prolapsed rectum, and passes, under the guidance of the finger, a silk suture, on one side of the sacrum, into the rectum, and out on the other side of the sacrum; the suture is then tied behind the sacrum. He reports three cases as cured, but it is questionable whether any of his cases were true prolapse of the rectum. From their description, one is more inclined to the opinion, that they were merely prolapses of the mucous membrane. Furthermore, while no ill luck followed any of his cases, surgeons at the present time rather fear the occurrence of infection after such an operation.

(*d*) Sick[4] argues against Ekehorn's operation, and in its stead recommends merely tamponade of the retrorectal space.

In fact, all of these operations are badly conceived; they all operate upon the posterior wall of the rectum, which, as we have shown, plays no rôle in the production of a prolapse.

2. Methods in which the fixation apparatus of the rectum is strengthened, through a laparotomy incision. They are based upon the notion that the fixation apparatus of the rectum through its connection with the sigmoid flexure is too lax. In consequence most of them are practically only sigmoidopexies, variously modified in their execution.

(*a*) Jeannel[5] sutures the sigmoid to the anterior abdominal wall. For the purpose of firmer fixation, and also for the sake of being able to treat the colo-proctitis by means of irrigations, he also opens the gut, and establishes an artificial anus which is to be closed at a subsequent operation.

In order to obviate this opening of the gut and yet to attain its permanent fixation, the operation passed through a number of modifications, but all are based on Jeannel's theory, of fixation of the sigmoid flexure. Thus:

(*b*) Weber[6] attaches the sigmoid to the fascia and muscles of the anterior abdominal wall.

(*c*) Herzen[7] fixes the sigmoid to the anterior abdominal wall, and in addition makes an anastomosis between its two limbs.

(*d*) Rotter[8] makes a retroperitoneal pocket in the left iliac fossa for the sigmoid flexure.

(*e*) Caddy[9] performs, what may be termed a proctopexy to the anterior abdominal wall.

(*f*) Ludloff[10] recommends division of the sigmoid, and fixation of the distal limb to the anterior abdominal wall after closure of its divided end; the proximal end is then implanted laterally into the distal.

(*g*) Von Eiselsberg[11] has advised resection of the sigmoid flexure, prior to its fixation to the anterior abdominal wall.

These are the operations which have gained the greatest favor among surgeons, at the present time. This is due to the ease of performance, and minimum of risk. It appears to me, however, that they are all badly conceived, because the distal end of the sigmoid is fixed to the sacrum, and pulling upon it can have but very little, if any, effect upon the prolapse of the rectum. Nor do I wish to speak at length, at this time, of the risk of unnecessarily fixing the intestine to the anterior abdominal wall; a danger which I have pointed out in a previous communication.[12] Theory aside, the futility of these operations is shown in the almost invariable recurrence of the prolapse after a sufficient period of observation.

IV. *Methods which attempt to get rid of the prolapse by resecting it.*

1. Gerhardt removed the prolapsed rectum by means of an eccraseur.

2. Weinlechner[13] removed the prolapsed rectum with a ligature.

[1] Verneuil. Bull. de la Soc. de Chirurgie, xv, 754.
[2] Gerard Marchant. Bull. et Mem. de la Soc. de Chirurgie de Paris, xvi, 288.
[3] Ekehorn. Archiv. f. klin. Chir., lxxxix, 463.
[4] Sick. Zentralbl. f. Chir., 1909, No. 36.
[5] Jeannel. Gazzette Hebdomadaire, May 24, 1899.
[6] Weber. Deutsch. Zeitsch. f. Chir., lxxii, 500.
[7] Herzen. Wjestnik Chir., 1901. Quoted after Beresnegowsky.
[8] Rotter. Zentralbl. f. Chir., 1903, No. 39.
[9] Caddy. Annals of Surgery, xxi, 153.
[10] Ludloff. Archiv. f. klin. Chir., lix, 447.
[11] Von Eiselsberg. Archiv. f. klin. Chir., lxvii, 746.
[12] Moschcowitz. N. Y. Med. Jour., July 14, 1906.
[13] Weinlechner. Verhandlungen der K. K. Gesellschaft der Ärzte zu Wien. June 8, 1883.

3. Esmarch [1] used for this purpose an elastic ligature, and finally

4. Mikulicz [2] (in reality done the first time by Aufert) removes the prolapse with knife and scissors, closes off the anterior cul de sac, and then sutures the outer and inner cylinders together, at the line of section. This operation has undergone numerous modifications, mostly as to the technique, e. g., Sheldon,[3] Cunningham,[4] etc.; but the underlying principle remains the same. It has, however, numerous objections. Amongst these I would mention: hæmorrhage; the difficulty to suture together two sections of gut of such unequal calibers as are the inner and outer tubes; the danger of sepsis and peritonitis; in fact, this is the only operation which has an appreciable mortality; and, last but not least, the fact that the number of recurrences, in spite of the great authority of its sponsor, is very high. This is readily accounted for according to the pathology I have offered. In fact, the operation may be said to even invite a recurrence, because the hernial sac still remains, and has, if anything, been brought down to a lower level.

THE AUTHOR'S OPERATION FOR PROLAPSE OF THE RECTUM

My experience with the operations just enumerated does not extend to all. I have tried several, (cauterization with the actual cautery, Delorme, Roberts, Thiersch, Bier, Marchant, sigmoidopexies of various kinds, and Mikulicz's method) that at the time have appeared to me to be rational, and have witnessed the results of a considerable number of various operations in the practice of my colleagues. In all, recurrence was the almost universal rule.

When my studies led me to the conclusion that prolapse of the rectum was in every essential a hernia, I set out to devise an operation in which the principles of an operation for the cure of a hernia could be carried out.

In my earlier studies, with this end in view, I conceived an operation which could be performed from below. I therefore performed the following operation in one case.

Abraham R., 50 years of age, was admitted upon the First Surgical Div. of Mount Sinai Hospital, in the service of Dr. A. G. Gerster (and I take great pleasure in acknowledging my gratitude for his co-operation and permission to operate these cases), April 17, 1908, with a prolapse of the rectum, four inches in length, and of twelve years duration. He was operated upon April 21st, by the following method:

An incision was made from about the middle of the sacrum to the posterior margin of the anal sphincter. The sacrum was now divided transversely, and the entire bone flap, including the coccyx and attached muscles, was reflected downward. My idea now was, to loosen up the rectum and retract it to one side, in order to reach the peritoneal sac. I was chagrined to find, however, that the ampulla of the rectum was so large as to completely block the anterior structures; furthermore, the resulting hole was so deep that sutures could be passed with the greatest difficulty only. To add to the embarassment, I had overlooked the important fact that we were dealing with a sort of a sliding hernia; in other words, there was no isolable and removable sac. However, I finished the operation by closing off by sutures that part of the cul de sac of Douglas which I had opened, and then sutured the two levators together and to the rectum. The bone flap was replaced and fastened by sutures. In the subsequent course the bone flap necrosed, necessitating its removal. Patient lived a little over four weeks, and died of an ascending pyelonephritis.

It is true that during his lifetime there was no recurrence of the prolapse, but I would not be understood as reporting a cure. On the contrary, in spite of the correct anatomical principle involved, I abandoned the procedure and returned to my original method, that of reaching the malady by the abdominal route. This is the one practiced by me at present, and which I submit for your consideration.

Median abdominal incision, extending from the symphysis pubis to the umbilicus. After opening the abdomen, the patient is placed in an extreme Trendelenburg position. Every one with any experience knows the depth of the cul de sac of Douglas in a normal case, but he will be intensely surprised at its depth in cases of prolapse of the rectum; in fact, it extends several inches beyond the anus, as one can readily convince himself. The rectum is now pulled up and held taut. The

[1] Esmarch. Deutsche Chir. Lief. 48. Die Krankheiten des Mastdarmes und des Afters.

[2] Mikulicz. Archiv. f. klinische Chir., xxxviii, 74.

[3] Sheldon. Surg., Gyn., and Obs., xi, 308.

[4] Cunningham. Annals of Surgery, xlix, 681.

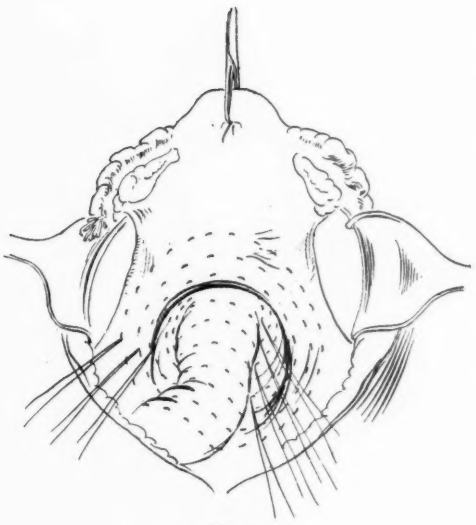

Fig. 13.

subsequent steps vary according to the sex of the patient; I shall describe an operation in the female sex.

Pagenstecher or silk sutures are passed circularly around the cul de sac of Douglas, and tied. The lowermost suture is placed about one inch above the inferior extremity of the cul de sac; similar sutures, six to eight in number, are passed at intervals, and persisted in as long as the peritoneum comes together until practically the entire pouch of Douglas is obliterated. (Fig. 13.)

It is advisable, and I always try to include in my suture the pelvic fascia, particularly that part which covers the levator ani; how often I really succeed in doing this I am not in a position to state.

(Theoretically it would be better to split the peritoneum in the depth of the cul de sac, and to suture the fascia first. I have attempted to do so in one case, but found the procedure so difficult that I abandoned it.)

When the sutures reach the region of the supravaginal portion of the cervix and body of the uterus, the sutures are anchored to these structures.

When approaching the rectum, the sutures coming from the sides of the pelvis, catch the serosa covering it, in firm and close stitches. This is done, in order to prevent the possible formation of a hernia; in addition, these lateral sutures also materially aid in fixing the rectum to the sacrum and coccyx.

There are two structures which should be avoided, namely, the ureters and internal iliac vessels. The former can be marked by introducing ureteral catheters; the pulsation of the latter serves as a guide; neither of these structures have thus far caused me any embarrassment.

In older women the uterus is stitched to the anterior abdominal wall.

No fixation of the intestine, viz., sigmoid flexure, is undertaken, as it is superfluous.

Suture of the abdominal wall in layers.

The after-treatment is simple. I neither constipate nor move the bowels of the patients. The bowels will generally move of their own accord in less than a week. I have found that most of the patients require catheterization. In other particulars the after-treatment is that of any laparotomy.

To my mind the operation thus described would be ideal and perfect, providing we could select our cases and operate only those depicted in Figs. 8, 9, and 10. After the prolapse has become complete, i. e., when the prolapsed anterior wall has also drawn down the two lateral and posterior walls, it may become necessary to add also some sort of a plastic or fixation operation. I have thus far done so in two cases only. I have purposely refrained from performing this step, because I wished to test the principles underlying my operation.

REPORT OF CASES

Case 1. Sophie K., 34 years of age, was admitted upon the First Surgical Div. of Mount Sinai Hospital, July 26, 1907, suffering from a rectal prolapse, which had existed four years. Local physical examination revealed a prolapse the size of a fist. July 30th I performed a typical operation. Primary union. Discharged August 21st.

Patient was last seen and examined by me March 2, 1912. The result after nearly five years, is ideal in every respect.

Case 2. Marie W., 44 years of age, was admitted upon the First Surgical Div. of Mount Sinai Hospital, December 9, 1908. She had been suffering for over fifteen years from the discomforts of a rectal prolapse. Numerous operations had been performed upon the rectum, and finally six years ago, sigmoidopexy. The benefit obtained from these

operations amounted to nothing, as they were promptly followed by a recurrence of the same dimensions as before operation.

Local physical examination revealed a prolapse the size of a child's head; the sphincters were very much relaxed, easily admitting the entire hand.

December 26, 1908, typical operation. Primary union. Discharged January 30, 1909.

Patient was last seen and examined by me February 24, 1912. The result is an excellent one. Patient considers herself cured; but on extreme straining, a narrow rim of mucous membrane just becomes visible.

Case 3. Elka I., 58 years of age, was admitted November 16, 1908, upon the Second Surgical Div. of Mount Sinai Hospital, in the service of Dr. Lilienthal. She has been suffering from a prolapse of the rectum, for a number of years. At first the prolapse was reducible by contracting the levator ani, for the past year it could be reduced only manually.

Local physical examination showed a rectal prolapse the size of an orange.

November 20th, Dr. Lilienthal extirpated the entire prolapse after a modified Mikulicz method. An uneventful convalescence followed; but while the patient was still in the hospital, a recurrence was noted, and reached a size of three inches.

January 10th, at the request of Dr. Lilienthal (and I gladly avail myself of this opportunity to again express my gratitude for his invitation to operate on this case) I performed a typical operation. Primary union. Discharged February 6, 1909.

Patient was last seen and examined by me February 26, 1912. The result is excellent. Patient considers herself cured, but on extreme straining a narrow rim of mucous membrane just becomes visible.

Case 4. Fanny P., 42 years of age, was admitted to the First Surgical Div. of Mount Sinai Hospital, February 4, 1910, complaining of incontinence of fæces, and a prolapse of the rectum, which had existed for three years. Local physical examination showed a rectal prolapse the size of a goose egg, and in addition a very large rectocele and cystocele.

February 8th. Typical operation. Primary union. March 3d, Hegar perineorrhaphy. Discharged March 21, 1910.

Patient was last seen and examined by me March 5, 1912. The result, as far as the rectal prolapse is concerned, is perfectly ideal; but she has a hernia in the laparotomy cicatrix.

Case 5. Harry H., 22 years of age, was admitted to the Har Moriah Hospital May 19, 1911, with a prolapse of the rectum, which had existed for sixteen years. Local physical examination revealed the presence of a prolapse of the rectum the size of a goose egg.

May 22d, typical operation, in the presence of Dr. Hy. Roth. Primary union. Discharged June 9, 1911.

Patient was presented at a meeting of the Surgical Section of the N. Y. Academy of Medicine December 1, 1911. He was last seen and examined by me February 22, 1912. Result ideal in every respect.

Case 6. Annie S., 50 years of age, was admitted to the Second Surgical Div. of Mount Sinai Hospital September 1, 1911, with a rectal prolapse, which had existed for six months. Local physical examination revealed the presence of a rectal prolapse the size of an orange.

September 6th at the request of Dr. Chas. A. Elsberg (and I take great pleasure in expressing my thanks for his invitation to operate on this case) I performed a typical operation. Primary union. Discharged September 28th.

Patient was last seen and examined by me February 26, 1912. Result excellent. Patient considers herself cured in every respect; but on extreme straining a narrow rim of mucous membrane just becomes visible.

Case 7. Jennie G., 50 years of age, was admitted July 29, 1911, upon the Gynecological Division of Mount Sinai Hospital in the service of Dr. Brettauer. She had been suffering for over fifteen years from a prolapse of the rectum, and was operated upon repeatedly from the rectal aspect, and once by laparatomy for its relief. August 1, 1911, she was operated upon by Dr. S. M. Brickner by a modified Bier method. None of these operations were followed by a curative result. On December 20, 1911, she was admitted upon the First Surgical Div. with incontinence of the rectum, and a prolapse the size of a goose egg. On account of the numerous preceding operations upon the anus, there was practically no sphincter present. After reduction of the prolapse, it immediately prolapsed, even in the recumbent posture, so that the patient never made even the attempt to reduce it.

December 27th, typical operation; primary union. January 10th, Hegar perineal plastic, at which occasion an attempt was also made to reunite whatever fibres of the sphincter still remained. Primary union. Discharged February 14, 1912.

Patient was last seen and examined by me February 24, 1912. Result ideal in every respect.

In connection with these histories, I take great pleasure in incorporating the following letters and histories.

N. Y., March 4, 1912.

My dear Doctor Moschcowitz:

Enclosed please find the history which I promised to send you. I have examined the patient to-day, and find that he is perfectly well and presents not the slightest evidence of a return of his former disease.

With kindest regards, I am

Sincerely yours,

(Signed) HENRY ROTH.

Case 8. Hospital No. 34543. Henry F., 25 years old, bookkeeper by occupation, was admitted to Lebanon Hospital on August 30, 1911, and gave

the following history. For the past eighteen years he has suffered from severe rectal tenesmus. During defecation he feels a large protrusion of the rectum. There is a passage of blood and mucus every time he has a bowel movement. The protruded bowel must be replaced to allow the escape of fæces. He was operated upon for prolapsed rectum three years ago, and again one year ago. In both instances the operation consisted in cauterization of the prolapsed bowel. He obtained very little relief from these operations. Shortly before his admission to the hospital he passed through an illness, which presumably was an attack of appendicitis.

On physical examination slight tenderness was revealed in the right iliac region. On straining, the rectum was readily prolapsed, the protruding mass being about six inches long and bluish red in color. It bled on the slightest touch. The patient was quite anæmic, but fairly well nourished.

Operation by Dr. Henry Roth, on September 6, 1911. Cœliotomy slightly to the left of the median line. Trendelenburg position, pelvis cleared of all intestine except sigmoid, which was pulled up as far as possible. The recto-vesical cul de sac was then obliterated by a series of purse-string sutures of Pagenstecher linen thread, according to the method of Dr. A. V. Moschcowitz. Appendix showed evidence of recent inflammation and was therefore removed. Layer-suture of abdominal wall. Had postoperative pneumonia, which ran a mild course.

Discharged cured September 28, 1911.

N. Y., February 28, 1912.

Dear Dr. Moschcowitz:

. . . If there are any other facts in regard to the cases which you wish to know, please let me know.

Very truly yours,

(Signed) CHARLES H. PECK.

Case 9. Mrs. E. P., 45 years, housewife, was admitted to the Roosevelt Hospital November 6, 1911, suffering from complete prolapse of the rectum, which on straining protruded several inches beyond the anus. All coats were included in the prolapsed portion.

The patient was emaciated and debilitated and, as the sequel proved, in no condition to be subjected to any major operation. The operation of obliteration of the cul de sac was performed on November 13, 1911, through a median laparotomy wound. The cul de sac was very deep, and the tier sutures of catgut were carried well up on the body of the uterus. The result seemed very satisfactory in keeping the small intestines out of the depths of the pelvis, and in anchoring the mesorectum to the lateral pelvic walls. The operation was apparently well borne, but suppression of urine developed, and the patient died on November 20, seven days after the operation.

Autopsy showed the sutures holding perfectly, the small intestine well up out of the depths of the pelvis, and what seemed effective anchorage of the rectum. Careful examination for possible inclusion of a ureter in the suture showed that both were free and uninjured.

Death was due to causes not connected with the operative procedure, and would have undoubtedly followed any major operation.

The conception of rectal prolapse, in complete cases, as a hernia of the pelvic contents, the sac of which is the cul de sac of Douglas, seems to me a most rational one, and obliteration of the cul de sac by suture is well worthy of a trial as a means of cure.

RESULTS

A total of nine cases have been operated upon, thus far, by this method. On account of the fatal issue of Case 9, there are available only eight cases for the purpose of estimating the ultimate outcome.

The final results may be judged from two viewpoints; that of the patient, and that of the surgeon. It is surprising, that in this instance the patient is better satisfied than the surgeon. In fact, from the patient's viewpoint the cures may be estimated at one hundred per cent.

From the hypercritical surgeon's viewpoint, however, I would say that only five cases (cases 1, 4, 5, 7 and 8) may be considered cured; not only symptomatically, but anatomically. By this I mean that in these five cases there is, not even on greatest straining, more of the mucous membrane of the rectum visible than is normal. In the remaining three cases (cases 2, 3 and 6) I estimate the percentage of the cure at about ninety. In other words, under normal conditions, for instance, during defecation or coughing, there is absolutely no deviation from the normal; but when the patient strains his utmost, the anus opens up, so that a narrow rim of the mucous membrane is just visible. I am of the firm opinion that even this can be corrected by the addition of a small plastic in the cases indicated.

PREVIOUSLY DESCRIBED OPERATIONS COMPARABLE TO THE ONE JUST SUBMITTED.

My studies on prolapse of the rectum date back six years. The first operation, done by the method which I described, was performed July 30, 1907, the last performed December 27, 1911. Appreciating the fallibility of any operation for prolapse of the rectum, which

has not stood the test of a long period of observation, I refrained from publishing this operation previously. I would not have done so even at present, had not an eminently successful case, which I presented at the N. Y. Academy of Medicine, stimulated our honored chairman to invite me to present my observations at this meeting.

Up to a few months ago I was under the impression that both my ideas and my operation were original with me. In the course of preparation of this paper, I discovered that Quenu and Duval,[1] in 1910, published a method in which two sutures are placed circularly in the cul de sac of Douglas. A more extensive search of the literature brought to light that Bardenheuer[2] and Samter[3] in 1902 advocated a similar procedure. While all these writers divined the essential principle of the operation for the cure of prolapse of the rectum, their understanding of the true pathology of the malady is not altogether perfect, inasmuch as they all recommend colopexy as a principal part of their operation, My contention is furthermore substantiated by the paucity of the theoretical aspects of the subject in their publications. In fact, there is not in literature one satisfactory, systematic exposition of the true anatomy and pathogenesis of prolapse of the rectum.

Indeed it is surprising that the operation was not conceived before, in view of the highly significant investigations of Waldeyer upon the anatomy of the pelvis, published in 1899. A careful perusal of the work suggests such an operation almost intuitively.

However, the question of priority of this operation is not a matter of profound importance. My main purpose is a desire to throw light on a subject which has commanded only superficial attention, and to interest you in an operation which brings relief to a class of patients that have hitherto obtained little or none.

[1] Quenu and Duval. Revue de Chirurgie, xli, 135.

[2] Sonnenschein. (Bardenheuer) Zentralbl. f. Chir., 1902, 1129

[3] Samter. Mittheilungen aus den Grenzgeb., etc., 1907.

GASTROENTEROPTOSIS

When Is Surgery Indicated?[1]

By JOSEPH RANSOHOFF, M. D., F. R. C. S. (Eng.), Cincinnati
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In the ever-widening border-strip between medicine and surgery, across which the internist and the surgeon regard the manoeuvers of each other with interest, or, possibly, with suspicion, stands the unfortunate visceroptotic, knowing not whither to turn. Passive from birth, through heredity, or by natur-anlage, he, or oftener she, is pushed from one to the other, and knows not where to land. Read the report of the combined meeting of the American Obstetrical and the American Surgical associations in the transactions of the American Surgical Association, 1910, and it will appear that the patient with visceral ptosis has been definitively given a passport to the domain of the internist, from which the orthopedist may yet get him by requisition. It is to be regretted that ptosis of the abdominal viscera was always considered by Glenard as only a part phenomenon of a very complex condition. There can be no question but that in very many cases this is true. Then, if it is not congenital, it develops early in life, is distinctly hereditary, and is unmistakable in its manifestations. A young woman, more rarely a male, without any of the pathologic causes of tissue relaxation, has stooped shoulders, a dry skin prematurely wrinkled, breasts pendulous, and an abdomen flabby, like that of a woman who has given birth to children, hernial apertures open, with uterus lowered

[1] Read before the Southern Surgical and Gynecological Association, Washington, December 1911.

and retroverted, with stomach dilated, a low kidney and a general tissue insufficiency as often manifested, for example, by a condition which does not seem co-related, namely, a flat foot. The circulation is poor, the muscles, even in action, are feebly outlined. The patient is habitually tired, psychically depressed, usually pessimistic; in short, a confirmed neurasthenic. Here is a condition which might well be termed "panoptosis," and in which surgery can offer but little.

There is, however, another large class of cases in whom the neurasthenic state is associated with some distinctive visceral displacement, either pelvic or abdominal, the local effects of which are easily under-valued or entirely lost sight of in the flood of phenomena vaguely called nervous. To dwell upon the latter is beyond the purview of this paper. But it is because of their preponderance that only too often the sufferers are passed from one specialist to another, without obtaining the careful analysis of their cases to which they are entitled. It is manifestly impossible to dwell on all the visceral ptoses in the time allotted me, and I shall limit my consideration to those of the gastro-intestinal tract. But one feature is common to them all, namely, that the nervous habit is as easily acquired and becomes as easily fixed in the visceroptoses as the universally recognized epileptic habit, in which even after the successful removal of the cause, as for example, from depressed fracture, the condition soon recurs. If anything is to be accomplished at all for the relief of the nervous manifestations of visceroptosis, the measures that are indicated in the individual case should not be delayed.

The contention is often made that neither the local symptoms nor the general manifestations of a visceral ptosis are proportionate to the degree of the displacement. This cannot be questioned. Again and again a woman with a complete prolapse of the uterus will suffer less than another with a relatively slight retroversion. The movable kidney that can be displaced from the loin to the pelvis will often produce no symptoms at all, while another one that moves but little beyond the normal limits by reason, for example, of an anomalous vessel, may give rise to very painful and even serious obstruction, which nothing but operation will relieve. A stomach which by prolapse occupies the upper pelvis may perform its function perfectly, whereas, another much less prolapsed may through loss of tone be greatly impaired. A mobile cæcum and a prolapsed colon may give no evidence, whatever, of their presence and be discovered accidentally at operation, and then even have their causative significance of the symptom-complex completely overlooked. It certainly has been the experience of every surgeon that a long, freely movable and nearly or quite normal appendix has been removed on the diagnosis of chronic or recurrent appendicitis. Indeed, the suspected offending organ may be normal in every regard. They are the cases without the history of acute and febrile attacks and in which the predominant symptoms are evanescent, colicky attacks, ill-defined gas pains in the lower right quadrant, and above all constipation with the endless train of nerve symptoms which it so often begets. If the pains recur after the operation, as they so often do in these cases, we lightly ascribe them to adhesions or regard them as manifestations of neurasthenia. We remember these operations as easy ones, because the cæcum, although perhaps at first not readily found because the ascending or transverse colon would get in the way, could, when found, be easily drawn into the wound together with a good part of the ascending colon. They are the easy operations for appendicitis. It is not only in the multipara that this condition is found, but often in young children and adolescents of both sexes. In its symptomatology the condition greatly resembles the pseudo-appendicitis of Nothnagel. What actually occurs is a ptosis of a mobile cæcum, of a mobile ascending colon, or of both. In still other cases the cæcum is enormously distended, veiled by these vascular adhesions and bands and perhaps covered by a long, pendulous, ascending or transverse colon. The following is a case in question.

Mrs. T., aged 40, the mother of three children, has for as least eight years suffered from obscure pains in the lower right abdominal quadrant. Has always been the subject of chronic constipation.

Headaches were of frequent occurrence and at times, when the constipation was especially prolonged, she had attacks of vomiting. The severe pains were paroxysmal in character and were believed to be due to a loose kidney. The course of the disease was afebrile. Relief had been sought by the patient at many hands, but without success. She had become a neurasthenic. The statement was made that during her paroxysmal attacks a painful swelling appeared in the right lower quadrant, which was believed to be the distended prolapsed kidney. Urinalysis negative. Ureteral catheterization with a leaded catheter and radiography revealed a phlebolith one half inch removed from the ureter. On the right side there could be moved under the examining fingers the distended head of the colon, from which, under pressure, the contents escaped. The operation revealed a normal appendix, the cæcum and lower portion of the ascending colon enormously distended and in the lower part distinctly movable. Velamantous injected adhesions, so well described recently by Gerster, on the surface of the cæcum and one band distinctively obstructive in its effect stretched like a wire over its front. With the division of this band and all the lesser ones in reach, an ocular and aural demonstration of its obstructive effects was given by the emptying of the colon with a gurgling sound. The operation was completed by the removal of the phlebolith from the pelvis, which was easily accomplished.

Except for the phlebitis found in this case, the condition described is not an unusual one. For example, Dr. Greiwe has recently reported that of a woman of 40, who from childhood had attacks of colicky pains with the history of abdominal pains. As far as she could remember, she had severe headaches. In one year she was reduced from 190 to 130 pounds. The appendix was removed during an attack some six months ago, and at the time of operation the colon was distended with fecal matter to its utmost capacity. Improvement did not follow. The tracing of the bismuth meal by radiography shows the motile function of the stomach to be normal. But after 24 hours the cæcum is still distended with the bismuth mass and the ascending colon shown to be of an unusual length. The transverse colon shows unusual angulation. Not until 48 hours after ingestion of the bismuth meal is it finally in position to be expelled.

Experiences are multiplying to show that although the appendix still occupies by far the first rôle as an etiological factor in acute affections of the ilio-cæcal region, there are many cases in which it is subordinate in importance. This, notwithstanding the dictum of Kelly that "primary typhlitis is among rarest of diseases," and the remark of Deaver that "stercoral typhlitis may occur," I do not deny; that it does occur, I do not believe. If with a seemingly normal appendix, conditions, such as have been described, are found, we must look to another cause. Just as non-perforative affections of the gall-bladder, of the stomach, or of the uterine appendages can produce peritoneal adhesions, so a malplaced distended colon, notably the cæcum as a result of fecal stasis, gives rise to the veiled adhesions. The removal of the appendix alone can relieve neither the local condition nor the attendant train of nerve symptoms. In view hereof, it becomes questionable to my mind whether the very short incision now so universally made in the interval appendix operations is the best to use in all cases. Surely in the cases under consideration more room is desirable both for exploration and for instituting the necessary remedial procedures.

This brings us naturally to the prolapse of the colon with its angulation, its long history of indistinct, ill-defined abdominal symptoms, its constipation and its far-reaching sequelæ. There are few who follow where Lane has led. But we are indebted to him for a clear, explicit and bold pronouncement of the causes and dire local and general results of fecal stasis. No one else has so clearly portrayed the deleterious results of colonic auto-intoxication. More than any other he has clarified our understanding of the progressive nature of a malady in which according to its severity the operative procedures to be undertaken must be proportionate. I might here allude to the operation of Hofmeister, performed by him in 23 cases with uniform success. He terms it "cæco-transversiotomy." It is an anastomosis between the cæcum and the pendulous transverse colon, and since it is designed to circumvent the angulation at the hepatic flexure, it certainly deserves much consideration. The excision of the enteroptotic colon will certainly not become, to say the least, a popular measure. Nor is it in most instances necessary. Even

the sidetracking of the colon by an anastomosis is, as a rule, superfluous. Suspension of the colon with as little reefing as may be necessary will answer every requirement. To make it effectual, however, the suspension should not be made by attaching one peritoneal surface to the other, unless the sutures are passed through the fascia of the abdominal wall. It is better even to divide the peritoneum, expose the fascia from within and then to sew the omentum in the space thus denuded. The lesson learned that peritoneal adhesions are readily stretched when peritoneum is sutured to peritoneum, as in the ventral fixation of the uterus, has a practical bearing in the fixation of the colon.

Every case of enteroptosis merits careful study, for the variations are manifold. In this study, radiography merits the first place in diagnosis, and without it any operation for fecal stasis is made in the dark. Recently I saw a man of 40, neurotic, constipated for years with suffering of indistinct character in the lower left quadrant. A tumor mass could not be felt, there was no tenderness, nor did repeated examinations show occult blood. A half dozen X-ray plates which were taken, all showed a V-shaped, pendulous colon in which the bismuth was never found. The operation revealed a tight band, the cause of which could not be elicited, nearly shutting off the descending colon from the sigmoid flexure. It was lifted on a spatula, divided and excised, and the lower segment of the descending colon freed. The constipation and the pain have been relieved and with them have gone the concomitant general symptoms.

Gastroptosis. The inspiration to write this paper was given me by the appearance in my office of a young woman of 31, on whom five years before I performed a gastro-suspension with gastroplication. Before that, she had run the gauntlet of specialists without avail. Postprandial distress, eructations of gas, occasional vomiting, persistent constipation, and so on, had been complained of for fully seven or eight years, had reduced her in weight and had played havoc with what I was told was her naturally sweet disposition. The birth of a child did not mend matters, nor make them worse. When she entered the hospital, she weighed 96 pounds. The X-ray taken by Dr. Lange, revealed a fundus resting on the iliac pan. It looked like the flabby cheese-bag of long ago. A picture, taken two hours later, showed the contents scarcely changed. The gastricatony was most marked and fully two thirds of the ingested milk bismuth meal were still in the stomach twelve hours later. The stomach held two quarts of fluid comfortably and without revolting. A gastropexy, or, rather, an omentopexy with gastroplication, was performed. The X-ray pictures, taken a week later, showed remarkable results. The stomach was in the best vertical position, with the pylorus low. Within five minutes of the ingestion of the milk bismuth, the motile function was in action. The gastric wall fitted to its contents like the skin to the sausage. This woman has continued well, does all her own housework, and is unconscious that she has either a stomach or nerves. Incidentally, her normal weight is between 115 and 120 pounds.

There is hardly a branch of medicine in which radiography is as helpful as in the one under consideration. The old classical anatomical illustrations, so familiar to us all, of the transverse or oblique stomach, do not correctly represent the viscus *in vivo* and at work; nor do the internists fairly show its everyday working capacity, when they analyze what it can do with a test meal, a piece of toast, a small piece of steak, and a glass of water. A stomach may be able to dispose of this and secrete the conventional two per cent of hydrochloric acid, and still be totally inadequate to the ordinary demands made on it in the everyday mode of eating and drinking. The merit is the radiologist's, who has shown us the wide variations in the position of the stomach in the normal individual and the speed with which it all but shoots its contents through the relaxing pylorus. The biographic illustrations by Cole make this process marvelously clear.

Deficiency of gastric secretion, while doubtless important, is less so than motor insufficiency, since the ingested food-stuffs are subjected to their chemical influence in the small

intestine, whereas the motor insufficiency cannot be compensated for, and must, if long continued, lead to gastrectasia, the symptoms of which need not be here enumerated.

To bring out the position and motor function of the stomach, I believe that the pictures should be taken in the upright posture, that being the one in which the stomach normally does its work. There is a tendency among clinicians to divide gastroptoses according to the degree of the prolapse, the extreme cases being those in which the greater curvature is in the pelvis and in which even the pylorus may become a pelvic organ. Any attempt to classify them as a basis for operative therapy is, in my judgment, ill-advised, because very many stomachs are markedly prolapsed without any disturbances of digestion. Indeed, gastroptosis of even a marked degree is far from an uncommon condition, both in men and in women in whom the gastrointestinal functions are perfectly performed. More important than the position of the stomach is its tone, as shown by the X-ray, and particularly the presence of what is akin to an antral sphincter, which shows itself by a constriction some inches removed from the pylorus. Quite recently MacLaren called attention to a number of these neurasthenic cases in which the appendix had been removed without benefit. Here, as in most gastroptotic cases, a temporary relief is given by putting the patient in the recumbent posture after eating. In just such cases as MacLaren describes, where the appendix has been removed, it has been conclusively shown that the gastroptosis is secondary to a mobile cæcum or prolapse of the colon. In considering gastroptosis I think we are justified from X-ray findings in dividing them into two classes. The first in which the stomach retains its vertical position and the pylorus, although prolapsed, still occupies a low point. In the second class of cases the stomach occupies a transverse or oblique position in which the cardiac end and the fundus are greatly depressed with the pylorus on a higher level. In the second class of cases even if the prolapse is of medium degree the functional disturbances are very much more pronounced, because of the angulation which occurs at the gastro-duodenal junction and because the chyme mass must be lifted uphill.

The all-important question of the relationship of the nervous conditions and of gastric disturbances to each other can only be here touched upon. Suffice it to say that the influence of the nervous system on the digestive functions, beginning with the salivary secretion and ending with the rectal sphincters, has been recognized from time immemorial. To make them responsible for the chronic inactivities of the stomach and colon is not warranted by this physiologic relationship. Moreover, the baneful effects on the nervous system of gastroenteroptosis have been removed by operation sufficiently often and permanently to warrant, in my judgment, the retroactive effect of such visceral displacements on it.

There is a German adage, which seems applicable to the question of treatment of gastroenteroptosis. It is, "Where there is no plaintiff, there can be no judge." In other words, a gastroptosis accidentally discovered should be let alone like similar nephroptosis. When, however, it gives rise to functional disturbances, which make for invalidism after reasonable efforts of conservative methods have failed, it is my judgment, from an experience now of 21 operations for gastroenteroptosis, that operation may be resorted to with at least a fair prospect of permanent relief. In this operation cognizance must, of course, be taken of the relaxations of the abdominal wall and of possible breaches in the pelvic floor. Since with the gastroptosis there is so often a prolapse of the middle colon, the incision in the middle line should not be too sparing. Particularly when the abdominal wall is greatly relaxed with diastasis of the recti a long incision permits a plastic operation on the abdominal wall, which by restoring its integrity and tone will go far to support the plastic work done within. In suitable cases the muroplasty of the abdominal wall merits equal consideration with that of the pelvic floor in the visceroptoses due to its tears or relaxation. A long incision, furthermore, permits free exploration and facilitates the technique of such displacements as may be found. The following case may be cited in illustration.

P. W., aged 40, was admitted to the Jewish Hospital on the 20th of March, 1910. For many years he had been suffering from abdominal distress, notably after eating. There never was any sharp pain. Only at times were they cutting in character. The nature of the food did not influence them. There was always a sense of bloating with gas eructations. The latter disturbed him very much and at times became uncontrollable. At infrequent intervals he vomits and headaches are of frequent occurrence. Constipation is habitual. no movement occurring without the use of cathartics or enemata. He is frequently unable to follow his business pursuits, has difficulty in breathing at times and suffers from sleeplessness. Present condition: Anæmic, fragile looking adult, weight 103 pounds. Is prematurely gray. There is a slight subicteric tinge of the skin. Heart and lungs normal. Urinalysis negative; stool examined for blood, examination negative. On pressure, there is some tenderness in the epigastric region. The liver appears somewhat mobile and the dilated gall-bladder can be readily mapped out. The stomach analyses which had frequently been made by a number of specialists showed an atonic stomach without any evidences of ulceration. The X-rays taken by Dr. Lange showed a gastroptosis with the fundus reaching to near the iliac crest and the pylorus on a higher level opposite about the fourth lumbar vertebra. The axis of the stomach was nearly transverse. The transverse colon was in the pelvis and angulated. The operation in the median line permitted the fixation of the stomach and colon by omentopexy, gastroplication and the drainage of the distended gall-bladder. Although it would have been easy to duplicate and shorten the suspensory ligament of the liver, as has been done by a number of German operators, I believed this step unnecessary. This patient made an uneventful recovery. He weighs 130 pounds, eats whatever pleases him and the stock of cathartics which he had on hand has not been diminished since the operation was performed.

There is no better judge of the nerve and mental state of a man than is his wife. In answer to my request as to his condition, his wife said, "You have made a new man of him."

In my cases of gastroptosis with much dilatation, I have practised, and, I believe, with good results, gastroplication of the anterior wall. Although from very high authority this operation on the stomach has been considered valueless, I am convinced that it adds to the rapidity with which, after omentopexy, the stomach regains its tone. The distension of any hollow organ for a long time, whether it be the stomach, heart, or the bladder, reacts viciously on its musculature. A hyperdistended bladder from prostatic enlargement may never regain its tone, even after the primary cause has been removed. By reducing the size of the stomach even moderately, as can be done by gastroplication, its musculature has its work facilitated and necessarily actually reduced in amount in proportion to the diminution of the stomach's capacity. The proper operation for lifting the stomach is omentopexy with the details of technique above alluded to. I do not believe that the stomach ought ever to be directly fixed to the abdominal wall. By omentopexy we replace in a large measure the horizontal shelf made by the mesocolon, on which the stomach ought to be supported. The shortening of the gastrohepatic omentum has never impressed me as a rational procedure, since its function as the suspensory ligament of the stomach is negligible.

I would consider this paper very incomplete without alluding to the large experience of Rovsing in the operative treatment of gastroenteroptosis. Three years ago he reported on 75 cases in Volkmann's Sammlungen, and again before the International Surgical Congress, with most remarkable results. His operation consists of passing three sutures through the entire thickness of the anterior wall of the abdomen and through the abdominal wall, thus obtaining, as he desires, broad adhesions between the two peritoneal surfaces. From my experience with omentopexy I believe that this operation is preferable.

In conclusion, I feel justified in submitting the following theses summarizing my views on the operative treatment of certain visceral ptoses.

1. Every case of gastroenteroptosis should be studied individually and should not be treated in a routine way, whether by medicine or operation.

2. If after the removal of a normal or nearly normal appendix the patient continues to suffer he should not be lightly classed among the hopeless neurotics. Rather is it the duty of the surgeon to see whether he has not overlooked some visceral displacement or torsion, which is the cause of the suffering.

3. A small incision in abdominal work has some disadvantages.

4. The conclusion of the internists based on

laboratory findings, as, for example, after ingestion of a test meal, cannot be made the basis of the functional capacity of the stomach under everyday conditions.

5. In many seemingly hopeless cases of gastroenteroptosis with marked neurasthenic symptoms, operation promises relief. If this is the result of suggestion, it is none the less valuable if the relief is permanent.

6. Whereas, of course, internal treatment, abdominal supports and postural treatment should be tried, operative interference should not be unnecessarily delayed, lest the habitus nervosus becomes too deep-rooted to be eradicated.

7. No gastroptotic patient should be operated on unless some actual functional disturbance can be demonstrated. To relieve this must be the aim of the operation.

8. Given a gastroptosis in which we can demonstrate distinct functional incompetence or deviations, the existence of nervous phenomena does not militate against operation, but may be the chief reason for performing it.

END RESULTS IN GALL-BLADDER SURGERY

By B. B. DAVIS, M. D., Omaha, Nebraska

As long as cases of gall-bladder surgery are dismissed at the outer door of the hospital, little will be known of the end results. Until the average condition of patients two, five, or ten years after operation, is known, one cannot intelligently advise operation, except in cases of dire necessity. Unless the life of the subject of gall-bladder disease can be shown to be more comfortable, on the average, after operation than before, he might better endure his ills as best he can and avoid surgery. In fact, to make a good case for the numerous operations made on the gall-bladder, it must be shown that the ratio of comfort and good health following these operations is more than enough to offset the danger, pain, loss of time, and pecuniary cost that they entail.

For a number of years the writer has been impressed with the meagre information at hand relative to the final fate of those who have been subjected to the varied surgical procedures practiced on the gall-bladder. An effort has been made to keep in touch, as far as possible, with patients of this class. As an aid to this they are encouraged to report for examination when possible and to inform me through their physicians should any untoward symptoms arise.

By correspondence and by personal examinations and interviews, I have been able to gain a fair knowledge of the postoperative condition of 234 cases, for periods ranging from six months to twelve years following their operation. Of this number, there are 60 males and 124 females, or approximately three females to one male.

Of the 234 gall-bladders of which the record is made, 150 contained stones, and 84 were cases of cholecystitis, acute or chronic, without stones. At the primary operation, 176 were drained and 58 were subjected to cholecystectomy. Only one, of the 58 cases on whom cholecystectomy was done primarily, had has enough postoperative trouble to require relief by secondary operation, and that was done to break up adhesions that were interfering with the emptying of the stomach. Relief was complete eighteen months after the operation.

Of the 176 cases of primary drainage, eleven have been such sufferers as to be willing to have another operation performed. The second operation, in ten of these cases, was cholecystectomy, with relief finally in all of them, but at least two of these continued to have considerable pain for several months. One of the cases operated a second time did not seem to show sufficient cause for cholecystectomy, and a drainage operation was done. The relief was only partial.

Aside from the eleven cases operated

secondarily for unrelieved or recurrent symptoms five have been readmitted to the hospital for medical and massage treatment without operation. Two of these patients were relieved by the hospital treatment and two received no benefit and are still suffering. The fifth case has been back twice and each time rest, hot packs, Carlsbad Salts, careful diet and light massage have given relief. His last stay in the hospital was only three months ago and it was agreed that if the symptoms return he will come back for a cholecystectomy.

Besides the five cases just mentioned that returned to the hospital for treatment I have records of twelve other cases that complained greatly for a time, but as far as it has been possible to ascertain most of them are better and at least seven are completely relieved.

My records in regard to persistent fistulæ are incomplete, but several have not closed for three to six months after operation. One of these was still discharging almost a year after she left the hospital, but as there was no pain and the general health was excellent the woman would not consent to another operation.

Another persisting mucous fistula was operated a second time and is one of the group of eleven cases already mentioned. Her pain was very severe whenever the fistula became temporarily closed, due evidently to the tension produced by the retained mucus. Occlusion of the cystic duct was found and cholecystectomy gave complete relief.

As nearly as it has been possible to learn the postoperative history of my cases, an encouragingly large number are practically relieved immediately and completely as soon as they recover from the operation. Occasionally a patient who has been comfortable while lying in bed begins to have pain and a dragging sensation as soon as he begins sitting up. Others leave the hospital feeling perfectly well, but begin to have more or less discomfort in the region of the gall-bladder as soon as they begin to move about actively. Without definite figures on this point I would estimate that 25 to 30 per cent of cases have varying degrees of discomfort, from only a slight feeling of uneasiness to pain severe enough to disable them for a time. The great majority of such cases completely recover in from one to six months.

Postoperative pain was much more frequent a few years ago, when ventro-suspension of the gall-bladder was practised in all drainage cases, than it is now. But even without attaching the fundus to the anterior abdominal wall the presence of the drainage tube produces a more or less intimate adhesion, which must occasionally produce pain and discomfort.

To enumerate all the causes which may produce postoperative symptoms is not easy. A few of them have been very instructive and have led to certain changes in procedure in order to avoid them.

1. With a dense attachment of the fundus to the abdominal wall high up, the weight of the liver pressing downward is doubtless often productive of postoperative pain and dragging. In the course of time the adhesions stretch or the parts accommodate themselves and relief is obtained.

2. Pericystic adhesions are often the cause of much distress. For several years it has been my practice to remove gall-bladders if their walls are denuded of peritoneum, they being certain to form new and dense adhesions.

3. Unless the cystic duct is patent and likely to remain patent the gall-bladder is certain to cause future trouble. If a stricture of the cystic duct already exists at the time of the operation, or if a stone is tightly impacted in the cystic duct, a condition certain to cause necrosis of the mucosa and ultimate stricture, I believe the viscus should always be removed.

4. Should the gall-bladder be very thick-walled, or distorted, or denuded of patches of mucosa, or if the wall is fibrous, it is in a condition which will always invite stagnation of bile, and such a condition is sure sooner or later to cause trouble. Gall-bladders of this description are a menace and should be removed at the primary operation.

5. Whenever the gall-bladder is in a condition favorable to normal function, as manifested by an elastic wall, a patent cystic duct,

a normal peritoneal covering and an intact mucosa, it should be retained. The great majority of the cases operated reasonably early in the disease need not be sacrificed.

6. Another frequent cause of incomplete relief of symptoms is chronic pancreatitis. It is a very frequent complication of gall-bladder disease, and should be looked for at every operation. If present, the drainage of the gall-bladder should be continued for several weeks, or until the condition of the digestion is as nearly perfect as is possible.

The result of my research in the cases I have been able to trace has been far from discouraging. In fact, the percentage of cases with really unsatisfactory results is so small, only twelve percent, and half of these were relieved by secondary operations, that it seems to me surgeons have a right to earnestly recommend operation in all cases of severe disease of the gall-bladder not promptly relieved by internal treatment.

As experience increases no doubt the number of cases not relieved will grow fewer. A more mature judgment will discriminate with more certainty between the gall-bladder that should be drained and the one that should be removed.

One noteworthy observation has been made. In two instances I have discovered that stones had been overlooked at the time of the operation and they have been removed at a secondary procedure. But only once have I found stones to have reformed after operation. This occurred in a case not mine at the primary operation. She was sent to me complaining of even more severe symptoms than before her first operation a year before. I found three chromic catgut sutures in her gall-bladder, they apparently having been used as purse string sutures. Each one was studded with stones like beads.

The reason apparently that stones are not likely to form again is that a definite infection is necessary to produce them. After the long, stormy experience from the primary attack till relieved by operation, a condition of relative immunity is evidently produced. We can therefore speak rather positively to patients contemplating operation and promise them that re-formation of stones is exceedingly unlikely.

In a paper on this subject read before the surgical section of the American Medical Association at the Los Angeles meeting in 1911, by Dr. E. M. Stanton, of Schenectady, New York, a distinction is made between the cases of stone and of cholecystitis. Although in the main in hearty accord with the conclusions he reached, I cannot agree with him that the results in operations for stones are better than when cholecystitis is present without stones. My results have been practically the same in these two classes of cases.

The fact is that operations are not done simply for the purpose of removing stones, or mucus, or precipitated cholesterin, but to relieve the patients of their pain and disability, which are not due to what happens to be in the cavity of the viscus but to the condition of the gall-bladder wall, or the duct wall. If the walls are healthy the stones do not harm. If it were possible to render the walls healthy without removing the stones or precipitated cholesterin, the symptoms would disappear. Thousands of people are carrying around gall-stones formed years ago after a gall-bladder infection and do not know it because they are perfectly comfortable. The infection no longer exists and they are to all intents and purposes well.

I cannot forego saying again at this time what I have said several times before that a patient should not be dismissed from the hospital after an operation as cured. The real cure takes time and is rendered much more rapid and certain by a careful diet, moderate but regular exercise and Carlsbad salts kept up for months. And after finally dismissing the case instructions should be given that at the least hint of further trouble in the vicinity of the liver or gall-bladder region recourse should at once be had to another Carlsbad cure.

INFECTION OF THE RETROPERITONEAL LYMPHATICS[1]

By JAMES E. MOORE, M. D., Minneapolis, Minnesota

THIS subject was so well written up by R. R. Huggins, of Pittsburgh, and published in Surgery, Gynecology and Obstetrics for March, 1911, that the only excuse for bringing it before you is that we may discuss it and that the writer may add his personal experience.

In the retroperitoneal space there are three separate groups of lymphatics: the mesenteric, which receives drainage from the small intestines and a part of the large intestines, and is the common seat of infection in tuberculosis of these parts; the celiac group, which lies about the celiac axis and receives drainage from the stomach, liver and pancreas; and the lumbar group, which extends along both sides of the vertebral column from the crest of the pelvis to the superior mesenteric artery and receives drainage from the lower extremities, the uterus, vagina, male generative organs, the rectum, sigmoid and descending colon. These three groups have channels of communication, so that they form a complete chain extending from the depths of the pelvis to the diaphragm and beyond. We are especially interested in the lumbar group, because it drains all those parts most frequently invaded by pyogenic organisms.

We are all familiar with perinephritic abscesses and retrocæcal abscesses when the appendix is outside of the peritoneal cavity, but, aside from these, comparatively few cases have been reported in which the abscess was known to be of retroperitoneal origin. We would naturally expect this large space behind the peritoneum, with its abundant areolar tissue and free lymphatic communication with parts so frequently the seat of infections, to be a very common location for abscesses. The chances are that owing to the inaccessibility of these parts infections, and even abscesses, often occur here that are not recognized. When there is an infection here the intestines usually become distended, which adds to the natural difficulties of examination. When chills, fever and sweating are present, the cause of which is not found in any of the usual locations, or when these symptoms continue after thorough drainage of pelvic or abdominal abscesses, the retroperitoneal space should be suspected. It is quite possible that in many instances where patients have died from sepsis without the abscess having been discovered, it was located in this region. The presence of tubercular abscesses in this location have been very frequently recognized. The reported causes of nontubercular abscesses in the retroperitoneal space are typhoid, appendicitis, salpingitis, infection following abortion and parturition, and suppuration of the inguinal glands. In some cases following parturition the infection has manifested itself as late as three months after labor. A few cases have been reported without apparent cause.

The writer's experience is limited to four cases, the first two occurring years ago, before laboratory facilities were at hand.

Case 1. Mrs. K., a multipara, aged 36, began to complain of severe pain in her back and down her limbs a few days after a miscarriage. She had frequent chills, high temperature and sweating. She was treated by curettage and vaginal douches. The writer was first called after she had been ill for several weeks and was greatly emaciated. She then had high temperature and sweating. The abdomen was distended and tender, and the right thigh drawn up. The whole limb was swollen and boggy, suggesting phlebitis, although it was on the right side. By vaginal examination the uterus was found slightly enlarged and movable, and a mass could be felt high up in the right side of the pelvis. This mass could be felt above Poupart's ligament. An incision was made above and parallel with Poupart's ligament, and a large amount of pus evacuated and drainage established. Numerous openings were made in the thigh and later in the leg, and drainage tubes introduced. The temperature dropped and the patient made temporary improvement, but after several weeks died from exhaustion.

Case 2. A woman, 42 years of age, had been treated for over two weeks for appendicitis before the writer was called. She then had high temperature, chills, sweating, and a distended abdomen.

[1] Read before the Western Surgical Association, Chicago, December 18, 1911.

The tenderness was not marked and the abdomen had not the "feel" of a peritonitis, but it was evident that pus existed somewhere deep down in the abdomen. No mass could be detected. An incision was made in the median line. The appendix and pelvis were normal. A fluctuating mass was detected to the left of the bodies of the vertebræ behind the peritoneum and extending between the folds of the mesentery. Drainage was established, but the patient died septic in a few days. A postmortem was not permitted, and the source of infection never discovered.

CASE 3. Hospital No. 552. P. D., an Irishman, 55 years old, a granite cutter, was admitted to the University Hospital April 9, 1910, on account of a large ulcer on the dorsum of the right foot, following a burn. The ulcer had existed for ten years, and had been treated in a hospital in Montpelier, Vermont, and elsewhere. He had been skin-grafted unsuccessfully. He is an habitual drinker, and is addicted to the use of heroin. The ulcer was first cleansed and treated antiseptically, after which graduated pressure, by means of strips of adhesive plaster, was tried, but without satisfactory result. Late in November he was skin-grafted with partial success. On January 17, 1911, he developed temperature and redness over both lower extremities. A diagnosis of erysipelas was made, and he was transferred to the medical side. On February 6th, patient complained of pain in left groin and deep in the abdomen. The inguinal glands became swollen and the thigh was flexed. His complaint of deep-seated, very severe pain in the back and abdomen was at first attributed to the fact that the amount of opiate he had been taking had been gradually reduced, but he began to have chills, high fever and sweating. At first no mass could be detected, but after some time a hard, tender mass could be felt deep down in the left side of the abdomen, and a diagnosis of psoas abscess was made. On February 10th he was referred back to the surgical service. At this time the mass could be felt, but was very deep seated. His hæmoglobin was 65, and he had a leucocytosis of 12,000. A blood examination was made with negative result. On March 17th an incision was made along Poupart's ligament, a large amount of pus evacuated and drainage established. A smear was made from the pus and streptococcus pyogenes found. On April 13th, twenty-seven days after the operation, he was discharged with the drainage openings and the ulcer on his foot healed. The glands in the left groin were swollen, but did not suppurate.

Should I be called upon to treat a case like this again, I would operate much earlier, making an incision above and parallel with Poupart's ligament, stripping up the peritoneum and establishing drainage outside of the peritoneal cavity, thus saving the patient much time and suffering.

CASE 4. Mrs. R., a multipara, aged 41, was confined on January 26, 1911. The labor was precipitate, and no vaginal examination was made. She was attended by a most competent and careful obstetrician. On January 30th, four days after confinement, she developed a fluctuating temperature with chilly sensations, but without pronounced chills or sweating. She complained of pain in her back, abdomen and down her limbs. Nothing abnormal could be detected in the pelvis, but after a time a mass could be felt deep in the left side of the abdomen, and the left thigh was drawn up. On March 10th, when the writer was called, the patient looked pale and worn, was running a daily temperature of 102,° and the mass in the left side of the abdomen was quite prominent. A diagnosis of abscess in the retroperitoneal space was made, and operation advised. She was moved to the Northwestern Hospital and on March 11, 1911, an incision was made just above and parallel with Poupart's ligament, the peritoneum stripped back, and a large abscess evacuated. Two large drainage tubes were introduced. The temperature dropped promptly. There was very free drainage of pus mixed with enough blood to cause some uneasiness, but all went well and in two weeks she went home, and in four weeks went for an automobile ride.

In the pus were found many pneumococci and a few staphylococci. A careful study of the possible sources of infection was made, and it was found that the bed pan used by the patient was the same one that had been used by her father, who had died of pneumonia a short time before her confinement. It seems rational to conclude that the diplococci were conveyed from this bed pan to her vagina and thence up through the lymphatics to the retroperitoneal space.

THE PRESENT STATUS OF ABDOMINAL CÆSAREAN SECTION

When and How Should the Operation be Performed[1]

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PERHAPS no abdominal operation has profited more by the great advances in technique following the discovery of the principles of antisepsis and asepsis than has the operation of Cæsarean section. From an operation almost always fatal and performed only as a last resort, its mortality has been gradually lowered until at the present time in favorable cases it is not more than two or three per cent, a mortality which one expects with non-septic gynecologic cases. With the operation thus shorn of its terrors, it is no wonder that it is being more and more resorted to, where, for one reason or another, the passage of the child through the birth canal is attended by difficulties. But this very ease of performance with its accompanying good results, like almost every abdominal operation, has led to the abuse of the operation, not merely in the number of unnecessary operations performed but in the kind of cases subjected to Cæsarean section. Some of us can remember the titles of papers appearing in the medical journals twenty odd years ago during the evolutionary period of pelvic and abdominal surgery. They stated the number of laparotomies performed, as if the mere figures carried with them some superiority on the part of the reporter. We know now that many of our abdominal operations of those days, performed in perfect honesty and in good faith, were entirely unnecessary. After the excitement had passed away and the good had been separated from the bad through a more careful study of pelvic and abdominal pathology and the end results of the operations, the surgeon began to strike his true pace. He studied his patient more carefully, brought to his aid every means of diagnosis with the idea of avoiding unnecessary operations which his experience had proved to be not only useless but attended by a certain mortality. It seems to me as if the operation of abdominal Cæsarean section were passing through a similar period of evolution. That in a certain kind of cases the uterus can be opened through an incision in the abdominal wall with great ease and with hardly any mortality, has been accepted as a demonstrated fact. Now the question is being asked, how many times was the abdominal operation unnecessary or avoidable? Under what conditions would it be best to adopt some other mode of procedure? In what class of cases is abdominal Cæsarean section distinctly contra-indicated? These and similar questions are being discussed by the more earnest and thoughtful of the present-day obstetricians. And out of this discussion will finally come the knowledge of the true place of the operation in obstetric surgery. It is with a view of eliciting a full discussion of this most important operation that I have ventured to select it as the title of this evening's paper.

It is evident that in the time at my disposal it will be impossible to discuss all phases of abdominal Cæsarean section, so I have selected the following subdivisions of the subject which I shall in turn submit in outline for your consideration.

1. In contracted pelvis is Cæsarean section, or induction of labor, most advantageous for mother and child?

2. Under what conditions is craniotomy on the living child indicated in preference to Cæsarean section?

3. In what cases of contracted pelvis is pubiotomy preferable to Cæsarean section?

4. Under what septic conditions is Cæsarean section indicated and when under similar conditions is the operation unjustifiable?

5. The types of the operation to be selected in different cases. Is the latest modification, extraperitoneal section, destined to be permanent or will the mortality and morbidity

[1] Read before the Allegheny County Medical Society, Pittsburgh, Pennsylvania, November 21, 1911.

of the operation lead to its abandonment? The technique:

1. IN CONTRACTED PELVIS IS CÆSAREAN SECTION OR INDUCTION OF LABOR MOST ADVANTAGEOUS FOR MOTHER AND CHILD?

The advantages of the induction of labor lie in the absence of maternal mortality if the most approved methods of inducing labor are employed. On the other hand, there is a considerable fœtal mortality connected with the procedure which probably no improvements in diagnosis or technique will ever materially lessen. The living fœtus should always be a part of the obstetric problem, and a considerable part at that. Its interests should be guarded in every way possible, provided the life of the mother is not too greatly jeopardized thereby. Whatever may be the theoretical considerations of the question of the relative value of the maternal and fœtal lives, in actual practice it resolves itself into giving preference to the mother's safety. And this is right, for with the mother saved and the fœtus dead, there is a great probability of future more fortunate conceptions. Whereas, with the mother dead and the fœtus surviving it is extremely problematical whether the latter will survive and reach maturity. Hence every way the question may be looked at, the mother should be given the preference when it becomes a choice between the two lives. The obstetrician's function is to so improve his art that the maternal and fœtal mortalities will be equally lowered by certain procedures. For instance, if, as in the induction of labor, the maternal mortality is practically nil, while the fœtal mortality is high, the obstetrical aim should be either to reduce the fœtal mortality or resort to another expedient which will not be too dangerous for the mother but will be better for the child.

It is obvious that it is unnecessary to consider the relative advantages of induction of labor and Cæsarean section in cases of major pelvic deformity, that is, where the conjugate vera is below 7 or 7.5 cm. Here the size of the fœtal head is so large in comparison with the diameter of the pelvis at the time when labor must be induced, the thirty-sixth week, as to make spontaneous delivery after the induction of labor impossible. Even where the conjugate vera is approximately 7.5 cm. spontaneous delivery after the induction of labor is rarely possible and artificial delivery of the premature child carries with it a high fœtal mortality while the maternal mortality can not be ignored.

In minor degrees of pelvic deformity where the conjugate vera is more than 9.5 cm. there is no need of considering either Cæsarean section or induction of labor, since such patients, whether primiparæ or multiparæ, should be allowed to go to term with the expectation that spontaneous delivery will take place or that in a small minority of the cases delivery will have to be aided by the forceps. There is only one exception to be made in this class of cases, namely, where there is a succession of labors each one more difficult than the last, due to progressive increase in the size of the children. Here the size of the fœtal head, added to the knowledge of what has gone before, may result in the classification of the particular case among those of medium pelvic contraction, the only variety of pelvic deformity where one has to choose between Cæsarean section and induction of labor.

In cases of medium pelvic contraction the conjugate vera measures any where from 7.5 to 9.5 cm. It is above the limit where Cæsarean section is imperatively called for; it is below the limit where the patient can be allowed to go to full term with every expectation that spontaneous delivery will result.

On paper what has just been stated looks plausible enough and very likely will be agreed to. But there is another aspect to the question. In the first place, we can not always be sure as to the exact measurement of the conjugate vera. We can only approximate its length, for mistakes are very likely to occur even with the most careful measurements. Furthermore, leaving out of consideration the impossibility of estimating in advance the propulsive strength of the uterine pains, it is far from an easy task to estimate the size of the fœtal head at a given period of pregnancy. While Müller's method and Kerr's modification of the same will throw some light upon the problem, errors of estimation are

only too likely to occur. So true is this that even in the cases of pelvic contraction under consideration, the medium variety, one would hesitate to advise either Cæsarean section or induction of labor in primiparæ who have not been subjected to the test of labor. This very hesitation shows the uncertainty of the problem, for if either operation were performed upon pelvic measurements alone, undoubtedly many primiparæ would be unnecessarily subjected to operation, who otherwise would have been delivered spontaneously.

In order to stand the best chance for life, because it is smaller and better able to pass through the pelvic passages, the fœtus should not be delivered until the thirty-sixth week of pregnancy. Before this time, while smaller, it is too premature; after this period there is apt to be a disproportion between the fœtal head and the pelvis. Yet the estimation of the duration of pregnancy is always open to considerable error, else the prediction of the expected date of confinement would be a far easier procedure than it is. Again, it is not always an easy matter to rear the premature infant, a fact which accounts to a certain extent for the high fœtal mortality accompanying induced labor.

As between Cæsarean section and induction of labor, the wishes of the parents should be given due consideration in the choice between the two operations. In a case of medium pelvic deformity with a conjugate vera of 7.5 to 9.5 cm., with previous labors resulting in a dead baby at term, the parents have a right to demand that a Cæsarean section be performed at term in the interests of the child. On the other hand, they have the equal right to demand that the mother be given the best chance and the fœtus a fair chance through the induction of labor at or about the thirty-sixth week.

Personally, while I would not go so far as Bar, Tweedie, Williams, Pinard and other obstetricians in placing the induction of premature labor among the unjustifiable operations, I do believe that in the interest of the child the procedure will be more and more abandoned in favor of elective Cæsarean section and pubiotomy.

2. UNDER WHAT CONDITIONS IS CRANIOTOMY ON THE LIVING CHILD INDICATED IN PREFERENCE TO CÆSAREAN SECTION?

It is always dangerous in any department of our profession to be too dogmatic. For instance, unthinking adherence to the aphorism that craniotomy on the living child is never justifiable will lead to the sacrifice of many valuable maternal lives. On the other hand, if the purpose of the above dogmatic statement is simply to call attention to the rights of the fœtus no particular harm will be done. From what has been said in the previous section, the necessity of safeguarding the rights of the fœtus is apparent. However, if it becomes a question between the maternal and fœtal lives, the mother must be given the preference.

The conditions under which craniotomy on the living child is to be preferred to Cæsarean section may be enumerated as follows:

1. When the mother is septic.
2. When the fœtus is feeble and not likely to live under any conditions.
3. When the fœtus is a monster or so badly deformed as to render its future existence problematical or undesirable.
4. When from the necessities of the case either craniotomy or Cæsarean section must be performed by unskilled hands.

1. When the mother is septic.

It is not an uncommon experience for the specialist to be asked to perform a Cæsarean section on a woman exhausted by a long labor, and undoubtedly septic from many vaginal examinations and futile attempts at forceps delivery. Cæsarean section under such conditions, where the woman is septic, carries with it an extremely high mortality, probably from 25 to 35 per cent. Leaving out of consideration the strength of the fœtus, for many under such conditions are feeble and doomed to die any way, craniotomy is the operation of choice whether the child be living or dead. Emptied from below, the birth canal can be antiseptically treated with minimum risks to the septic patient. Emptied from above with certain contamination of the peritoneum, the mortality must always

be high despite every attempt to improve the operative technique with a view of preventing sepsis.

The means to be employed to determine what cases are so septic as to call for craniotomy on the living child in preference to Cæsarean section will be considered under another division of our subject.

2. When the fœtus is feeble and not likely to live under any conditions.

It is obviously an ill-advised procedure to expose the mother to great risks for the sake of a fœtus which is so feeble as to render its future existence improbable. Not infrequently the advisability of Cæsarean section is gravely debated when the life of the fœtus has been greatly imperiled by repeated attempts at forceps extraction. Unsuccessful endeavors to drag the floating head through the contracted inlet almost invariably jeopardize the life of the fœtus. Impacted head is a contra-indication for Cæsarean section, whether the fœtus be alive or dead, except when the conjugate vera is less than five centimeters, making it an impossibility to extract the craniotomized child from below. In this case in spite of impaction and possible sepsis the suprapubic operation, preferably hysterectomy should be made.

3. When the fœtus is a monster or so badly deformed as to make its future existence problematical or undesirable.

Very few would argue against the advisability of performing craniotomy upon a monster or a badly deformed fœtus, rather than to expose the mother to the risks of a Cæsarean section. The great difficulty is in making a diagnosis of the condition. Not long ago I performed an elective Cæsarean section upon a woman with a contracted pelvis, and had the rather unpleasant experience of delivering through the incised uterus a hydrocephalic child with a marked spina bifida. The child died a week or two later from an increase of the hydrocephalus. As far as I know, there was absolutely no way of suspecting such a condition existed *in utero*. On the other hand, where labor has proceeded, the cervix is dilated and the condition of deformity or monster diagnosticated, craniotomy would be the operation of choice if the size of the fœtus has to be diminished in order for delivery to take place through the natural passages.

4. When from the necessities of the case either craniotomy or Cæsarean section must be performed by unskilled hands.

The maternal mortality will be high where either operation is preformed by unskilled hands. However, the mortality will be infinitely higher if Cæsarean section be attempted. A certain number of babies might be saved but only at the expense of a considerable proportion of the mothers. The reason for this is apparent. Work from below is never so dangerous to the mother because the peritoneal cavity is uninvaded. Tears of the uterus and vagina would undoubtedly occur during craniotomy but they are usually taken care of when the woman's vitality is good. That this is true is proved by the comparatively low maternal mortality of forceps operations where the instruments are applied with no adequate idea of the principles underlying such application and the fœtus pulled from the birth canal by brute force. It has been proved time and time again that women will stand much when the operation is subpubic; very little, when it is suprapubic. Hence, craniotomy on the dead or living child is to be preferred when a skilled consultant can not be obtained and the woman must be delivered if her life is to be saved.

3. IN WHAT CASES OF CONTRACTED PELVIS IS PUBIOTOMY PREFERABLE TO CÆSAREAN SECTION?

Pubiotomy does not come into competition with Cæsarean section in cases of major pelvic deformity where the conjugate vera is 7 or 7.5 cm. or less. Pubiotomy performed under such conditions calls for so much separation of the cut edges of the pubic bone as to seriously endanger the integrity of the sacroiliac joints. Here Cæsarean section is the operation of election, and, performed before or at the beginning of labor, should not give a mortality above two per cent.

It is in cases of medium pelvic deformity with conjugate vera from 7.5 to 9.5 cm. that Cæsarean section and pubiotomy come into competition with each other. In such cases we are not in a position at the present time to say that such and such a primipara will be unable to give birth to her child. This can only be determined by a test of labor. It is surprising what the uterine contractions will accomplish in some of the cases where spontaneous labor has been judged to be almost impossible. Hence in the class of cases under consideration it is not justifiable to perform elective Cæsarean section. If a three or four hours' second stage shows that spontaneous delivery is not going to take place, and easy traction with the forceps fails to accomplish anything, it is best to perform pubiotomy in place of Cæsarean section, since the results of the former are better at this stage of labor than are those of Cæsarean section. A little aid is all that is needed to accomplish delivery, and that is afforded by the added pelvic space given by the pubiotomy. Repeated vaginal examinations or attempts at forceps delivery, in other words, where the patient is decidedly septic, are sufficient to contra-indicate either operation; for both pubiotomy and Cæsarean section are attended by a high mortality when performed upon septic patients. Here craniotomy upon the dead or living child is plainly indicated.

In multiparæ where we have both the pelvic measurements and the history of previous confinements to go by, one must decide between Cæsarean section and pubiotomy if the patient is seen before the advent of labor. Where this labor has been very difficult in cases of medium deformity with resulting dead fœtus, probably the choice will be an elective Cæsarean section. In other cases it will be thought best to give a test of labor, with a pubiotomy at its completion if that be found necessary.

Personally, when in doubt I am in favor of the Cæsarean section just prior to, or at the beginning of, labor; for the operation performed at such a time under suitable surroundings with proper equipment and able assistants will give a better mortality for both mother and child.

4. UNDER WHAT SEPTIC CONDITIONS IS CÆSAREAN SECTION INDICATED AND WHEN UNDER SIMILAR CONDITIONS IS THE OPERATION UNJUSTIFIABLE?

It has long been recognized that the results of Cæsarean section vary greatly according to the time at which the operation is performed in reference to labor. Reynolds analyzed 289 Cæsarean section cases and found the mortality was 1.2, 3.8 or 12 per cent respectively, according as the operation was performed during the last days of pregnancy, early or late in labor. This can mean but one thing. The results vary according to the absence or presence of sepsis in the patients. Similar observations have been made by others, but perhaps the most striking array of figures on this point has recently been published by Routh of London. He collected 1,282 cases of Cæsarean section performed by over one hundred obstetricians and gynecologists of the United Kingdom. He found that where attempts had been made to deliver by forceps or where repeated examinations had been made, the mortality was 34.3 per cent. When the patient was in labor and the membranes ruptured but no attempt had been made to deliver, the mortality was 10.8 per cent. When the patient was in labor with the membranes unruptured the mortality was 2.2 per cent, and, finally, when the patient was not in labor the mortality was 3.6 per cent. Combining cases not in labor with those at the beginning of labor with membranes intact, there was a mortality of 2.9 per cent, whereas in the cases where the membranes were ruptured or where frequent examinations or attempts at delivery had been made the mortality was 17.3 per cent.

These figures show that frequent examinations and attempts at delivery mean almost sure infection of the patient, while rupture of the membranes prior to the Cæsarean section means a probability of infection. In other words, two classes of cases must be distinguished. All of us have made these divisions of our cases but not with such scientific accuracy as Routh has done with his larger series of cases. If a patient be brought to the hospital with swollen and lacerated

vulva, a rapid pulse and possibly a temperature, with a history of repeated examinations and attempts at delivery with high forceps, we do not hesitate to perforate whether the child is living or dead. But we have failed to recognize the danger of Cæsarean section in less pronounced cases where we supposed the operation perfectly justifiable. I consider that Routh has made a distinct contribution to obstetric science in thus emphasizing the danger of Cæsarean section in what he characterizes as "suspect" cases. The difficulty lies in determining just which cases are infected, or if infected which ones are probably too badly infected or infected with too virulent organisms to warrant a Cæsarean section. Where the membranes are ruptured Routh thinks a very good idea of the presence or absence of infection can be obtained through the microscopic examination of the amniotic fluid by means of films. Roughly through this means it can be almost immediately told whether the fluid is sterile or infected, and upon the result of such findings will depend the kind of treatment to be adopted.

I have been very much interested in this suggestion, because for some time I have been convinced that premature rupture of the membranes, that is, rupture occurring before the advent of labor or early in the first stage of labor, is a distinct menace to the patient because of the danger of infection. With this in mind, I asked my assistant, Dr. George Kamperman, to investigate the records of a series of cases in the maternity ward with reference to the frequency of sepsis in premature rupture of the membranes. In a series of three hundred cases he found that mild sepsis occurred eight times as frequently after premature as after normal rupture, while severe sepsis occurred twenty times as often. Thus it would seem as if clinically it could be shown that premature rupture of the membranes predisposes toward sepsis. This series of clinical investigations will be followed up by a series of microscopic and bacteriologic examinations of the amniotic fluid following premature rupture of the membranes, so that the results of these observations may be compared with the clinical findings.

While without doubt it is desirable to determine by every scientific means possible, cases suitable for Cæsarean section and those where it is contra-indicated, we must be very careful about placing too great dependence upon ultra-refined methods of diagnosis. Microscopic and bacteriologic diagnostic means are excellent and indispensable, but they are not the entire equation, by any means. I think every surgeon nowadays reserves the right to operate in certain cases or refrain from so doing where his judgment is based upon his clinical knowledge and experience. And by so doing he is not unmindful of the great debt he owes bacteriologic and pathologic examinations in his everyday work.

If Humpstone had been guided solely by bacteriologic findings he probably would not have been able to report twenty-five Cæsarean sections without maternal or fœtal mortality, where there were only six elective Cæsarean sections, the remaining patients having been in labor at the time of the section anywhere from two to fifty hours. This probably is an unusual experience, but it clearly shows that good results can be obtained in a series of cases where from their nature some of the patients must have been somewhat infected at the time of operation.

Routh seems to think favorably of Maxwell's suggestion in doubtful cases of infection where the membranes are ruptured before performing Cæsarean section, of irrigating the amniotic cavity and incidentally the fœtus with normal saline solution. Personally, such a method does not appeal to me. It would seem impossible to materially improve conditions by such a method in an infected sac, considering the irregularities of the cavity to be irrigated. It would even seem as if the chances of carrying the bacteria upward would be greater than the probabilities of washing them away from above downward.

After all, the main facts for the obstetric surgeon to keep in mind are that Cæsarean section is a comparatively safe operation in clean cases. A case is considered clean before the advent of or just at the beginning of labor, provided nothing has been introduced into the genital tract from below. That the longer

the patient has been in labor, and especially the longer the interval since rupture of the membranes, the more probability is there of sepsis and the greater the danger from Cæsarean section. That many vaginal examinations, especially without proper precautions, and many attempts at delivery from below almost invariably mean serious sepsis and contra-indicate Cæsarean section, at least the classical variety.

5. THE TYPES OF OPERATION TO BE SELECTED IN DIFFERENT CASES. IS THE LATEST MODIFICATION, EXTRAPERITONEAL CÆSAREAN SECTION, DESTINED TO BE PERMANENT, OR WILL THE MORTALITY AND MORBIDITY OF THE OPERATION LEAD TO ITS ABANDONMENT? TECHNIQUE.

In a general way, it may be stated that in clean cases classical Cæsarean section, the Sänger operation and its modifications should be employed. In septic cases where it is thought wise to do a Cæsarean section, the choice of operation will lie between, supravaginal hysterectomy (Porro operation), panhysterectomy and the various forms of the extra-peritoneal procedure. As has been pointed out, the classical operation is dangerous in the presence of sepsis. It is dangerous in two ways; first, it carries with it the great danger of peritoneal soiling following incision of the uterus; second, it leaves behind a septic uterus which not only is very likely to give rise to puerperal infection, common to such a uterus where uterine incision has not been made, but there is the added danger of possible infection of the uterine incision with subsequent escape of septic material into the general peritoneal cavity and ensuing peritonitis.

The ablation of the uterus after the delivery of the fœtus removes a septic organ and the principal source of subsequent infection, and the results of the Porro operation have been much better in septic cases than those following the classical operation. Still, the removal of an organ is in one sense a confession of defeat. There is a natural aversion to the removal of the uterus and the sudden ushering in of the menopause with all its accompanying distressing symptoms. To avoid this removal, the Germans have revived an operation proposed by Jorg in 1806 whereby the uterus can be entered beneath its peritoneal covering, or as near an approach to this as possible. It may be observed in passing that this operation is nothing new in this country, since Thomas, Skene and others performed it here during the seventies under the name of gastro-elytrotomy as a substitute for the classical Cæsarean section with its, at that time, extremely high mortality.

There are a number of ways of performing this extra-peritoneal operation, methods associated with the names of Frank, Sellheim, Doederlein and Latzko. But whether the attempt be made to open the lower uterine segment through an incision parallel to Poupart's ligament, or transperitoneally with a temporary stitching of the visceral to the parietal peritoneum, the real object is to incise the lower part of the uterus beneath the peritoneum so as to avoid peritoneal infection. Necessarily, the operation comes into competition with supravaginal or panhysterectomy after removal of the fœtus, since all are used in septic cases. It is yet to be determined which is the better procedure. Personally, I have my doubts, as have most American operators, about the advisability of a procedure such as extra-peritoneal Cæsarean section, which from the nature and location of the incision must expose large areas of cellular tissue to infection. In non-puerperal work, it is what we seek to avoid, for experience has shown that where such large areas become infected, if the patient escapes with her life, dangerous sequelæ, such as thrombophlebitis, are apt to follow. Better primary results and less morbidity have followed removal of the septic uterus and appendages, thus giving an opportunity to institute thorough dependent drainage.

But while extra-peritoneal Cæsarean section does not appeal to me, from a surgical standpoint, I am willing to be convinced, and shall follow the results of the procedure in the hands of others with much interest.

Sellheim's modification of cervical Cæsarean section in septic cases by the formation of a utero-abdominal fistula at the lower part of

the abdominal wound seems to be a more surgical procedure, since it shuts off the peritoneum and provides for drainage.

In certain cases where the sepsis is not very pronounced, Kerr's plan may prove of advantage. After carefully protecting the peritoneum from contamination he incises the uterus and extracts the child. Then the placenta and membranes are separated from the uterus and pushed down through the cervix, from which they are removed by an assistant.

All the above-mentioned methods must necessarily be attended by a high mortality and great morbidity. In septic cases we must select the method which will give the best results for the mother, as the results for the child are about the same, no matter which operation is elected. It may be that each of the above methods will be abandoned, at least in the badly septic cases, in favor of craniotomy, a much more rational operation, as far as the mother is concerned.

In conclusion, a few words on the technique of the classical Cæsarean section. The simplest technique is the most desirable. I prefer a six-inch incision, three inches above, three inches below and to the left of the umbilicus. Except where one has reason to think the amniotic cavity is infected, I prefer to incise the uterus before delivering it outside the abdominal cavity. No gauze packs are used but the uterus is pressed against the abdominal incision by the assistant. A longitudinal incision in the uterine wall is made with the knife, no scissors being used. The placenta, if it be situated anteriorly, is cut through or pushed aside. The child is grasped by the feet and delivered, the assistant following this movement by the delivery of the uterus through the abdominal incision. The removal of the placenta is followed by the careful removal of the membranes which sometimes are adherent to the wall. Only when there is excessive oozing does the assistant bother to grasp the broad ligaments. In the great majority of cases the uterus itself is the best hemostat. The myometrium is brought together with continuous No. 2 twenty-day catgut. Two sutures are employed, sometimes three. The peritoneal surface is brought together with a continuous silk Lembert suture. The abdominal wound is closed in the usual manner by tier and retention sutures. No gauze is used in the cervix for drainage either in primiparæ or multiparæ, no matter whether the operation is performed during pregnancy or after the advent of labor.

The after-treatment is the same as for any other laparotomy, or, for that matter, after the first few days, any other puerperal patient.

SURGERY OF THE CERVIX UTERI

By HENRY P. NEWMAN, A. M., M. D., San Diego, California

IN scarcely any department of surgery has operative technique made quite the advancement or reached such a high degree of excellence as in abdominal and vaginal work upon the female genitalia, yet there are still many steps ahead on the road that leads to perfection. Both major and minor surgery of these important structures must concern themselves with the remote and immediate causes of disease and with the effect of operative interference upon the functions of the organs attacked, as well as with the restoration of gross anatomical relations. For instance, the operation known as trachelorrhaphy, or Emmet's operation, has been before the profession for half a century. It has had a brilliant history and has won honors for the originator wherever gynecology is practiced, but, like many good things, it is not only capable of improvement, but has now been largely superseded by plastic work looking toward removal of diseased tissue, restoration of organic function, and remodelling of the cervix to as nearly normal outlines as possible. These

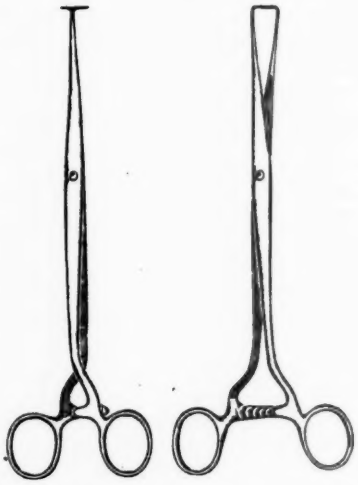


Fig. 1. The author's intra-uterine tenaculum forceps. The blades can be made to pass each other and point outward without unlocking.

operations are commonly known as amputations, which is incorrect and misleading, since it suggests the crudeness of the former excision of the neck of the uterus and in no way conveys all that is comprehended in the newer work. It has been said that so long as there are twenty-five methods of doing a thing, none of them is good. This has a measure of truth in it, but the progress of surgery is marked by the passing of modification after modification of good methods, and only in such a way can perfection be reached. In general, it may be said that that mode of procedure is most excellent which requires least preparatory and after-treatment, and which exacts least in the way of time and patience from patient and physician. There has been a reaction against the tedium of routine local treatment that bids fair almost to go too far and abrogate it altogether. It is a detriment to any patient to be subjected to prolonged topical treatment. It has the tendency to establish the habit of invalidism and to fix the attention inward, which is not a healthy stimulus to recuperation. I have for some years sought to do operative work of such a character that as much as possible may be accomplished at one sitting and the

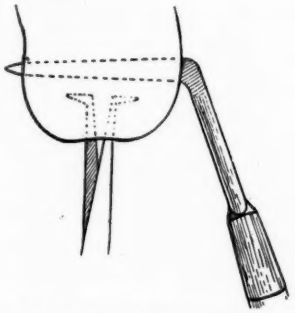


Fig. 2. Cervix transfixed preparatory to making flap; forceps readjusted within cervix.

patient led to expect prompt recovery and encouraged to consider herself well and free from bondage to the gynecological chair. The results, so far, have been satisfactory, and I would like, as briefly as possible, to call attention to a manner of operating which differs materially from any heretofore described, and possesses certain advantages which I hope will commend themselves in comparison with existing modes. The poor results of plastic operations complained of by some good operators I believe to be due to ill-chosen methods rather than faulty technique. That is to say that following the older methods of Emmet, Schroeder, Pozzi, and others, so far described, does not attain what is desired, because these methods, through inherent fault, do not meet the indications.

The following criticism was made by the late A. Palmer Dudley, of New York, in the discussion of this subject before the Society in 1895: "In closing the wound, one is very apt to narrow the canal to the extent of obstructing the escape of the normal discharges from the uterus, thereby injuring the woman instead of benefiting her. Many here can recall cases in which, before operating for laceration of the cervix, they could recognize no disease of the uterine appendages, while afterward disease developed. Why? Simply because in repairing the cervix they closed it, preventing the normal discharge from the uterus, inducing continual passive congestion of the endometrium, and the disease then traveled up the tubes."

Concerning the indications, we may add to

the classical list—namely, "malignant diseases, great enlargement from cervical hyperplasia, longitudinal cervical hypertrophy, conical and projecting cervix, and granular or cystic degeneration of intractable character"—laceration, chronic metritis and cervicitis, certain forms of displacement, what is known as congenital elongation or infantile uterus, and stenosis. Concerning this latter, *Gould's Year Book* for 1898 remarks that true cervical stenosis is a comparatively rare disease and exists most often in the mind of the physician.

Notwithstanding this formidable comment upon a former paper of mine, presented to the American Medical Association, the incontrovertible argument of experience in the reality of the thing only confirms me in the opinion that cervical stenosis, whether of traumatic or congenital origin, is a potent factor in the etiology of much pelvic pathology and an indication of radical error in the hygiene and growth of women. What is known as congenital stenosis is rarely the result of embryonic divergence, but rather persistence of the infantile condition through lack of proper development at puberty, or the developmental period.

In advocating amputation of the cervix for inflammatory conditions, L. Touvenaint says: "The curette, which gives excellent results in chronic corporeal endometritis, is altogether insufficient in cervical endometritis. The operation gives brilliant results preceded by curettage. We say preceded by curettage because it is rarely the case that inflammation of the cervix has not been propagated to the cavity of the body and become general. It has certainly been established that amputation is the operation of choice." He further says: "Amputation of the cervix is not done solely for the sake of removing a part of the organ; it possesses also the advantage of inducing profound modification in the vitality of the entire uterus, so that this undergoes a veritable involution."

Whatever exception might be taken to so radical a procedure for inflammatory involvement alone, it is apparent to all that when a part of certain glandular organs which are hypertrophied is cut away, the remaining tissue shows a marked tendency to decrease

Figs. 3 and 4. Fig. 5.

Fig. 3. Right-angled or tracheloplasty knife.
Fig. 4. Needle with fixed holder.
Fig. 5. Formation of flaps. Plug of pathological tissue grasped by forceps and ready for excision, with curved scissors just above the tenaculum points.

in bulk. Curettage alone does not always accomplish this result, although it can do much, and in connection with excision is a valuable adjunct. Not only the cervix, but its mucous lining, differs from that of the uterus in essential particulars, and chronic inflammation creates a dense, firm tissue with deep glandular involvement, which only a sharp curette thoroughly used can remove. Such removal is apt to result in constriction of the canal, amounting to a severe stenosis or even atresia unless followed by tedious and objectionable after-treatment. As the term "amputation" conveys the sense only of the taking away of the diseased organ, while the object of ideal operating is the removal of adventitious tissue only, plus restoration of anatomical conditions and re-establishment of normal function, I prefer to distinguish by a more descriptive name the following operation:

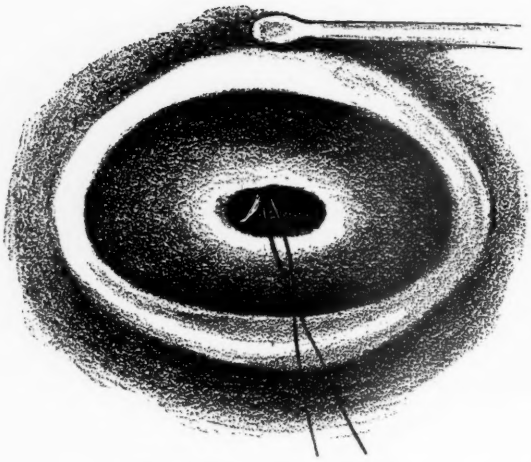


Fig. 6. The plug of tissue is removed and flaps falling inward are ready for stitching.

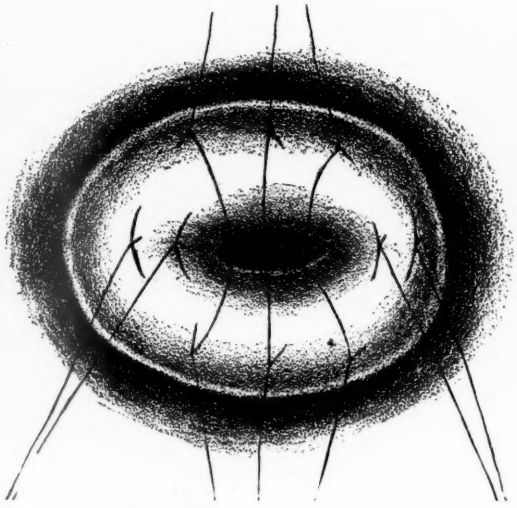


Fig. 7. Showing stitches *in situ* and manner of tying in groups.

TRACHELOPLASTY

The patient, being surgically prepared, is placed in the lithotomy position and the cervix drawn down with a vulsellum forceps, bringing the uterus well into view. The cervix is dilated and the uterus curetted if indications for curettage exist. These are, however, so nearly constant as to make it practically the rule. The cervix being drawn down with the bullet forceps or a double tenaculum, the blades may be reversed and replaced within the cervix so that their points are directed laterally from within outward, but I prefer to use the specially devised instrument which you see here (Fig. 1). By using it in this manner, traction is made upon the inner area of the cervix, leaving the anterior and posterior walls free for making the flaps. The cervix is now transfixed by this special knife (Figs. 2 and 3) and a clean cut made from above downward, first in the posterior lip. The anterior lip is transfixed in a similar manner, about 1 or 1.5 cm. in front of the other and cut in the same way. The intervening plug of diseased tissue is now removed by a single cut or two of the curved scissors, the tenaculum forceps having been changed to a lower position to allow it. The flaps thus made will now fall together and inward so as to assume the appearance of a normal cervix and will require only six or eight sutures to keep them in this position (Fig. 6). The first suture is passed through the centre of the anterior flap 1 cm. or more from its cut edge, and brought out ¾ cm. within the cervical canal. Two parallel stitches are now placed at each angle of the cervical canal. Silkworm or catgut is the suture material, and the employment of this fixed needle and holder (Fig. 4) renders an otherwise difficult procedure quite easy. The posterior lip is treated in the same manner, except that here it is easier to pass the sutures from within outward, while the reverse is true in sewing the anterior lip. Two sutures are now passed, as in trachelorraphy, through the outer angles of the wound, which gape slightly after the turning in of the flap. For nice adjustment of the stitches and for ease in removal I am in the habit of treating them

Fig. 8. The author's tissue forceps and uterine tampon carrier.

in this way. In tying the sutures one end of each is left long, and these long ends are grouped by tying them together according to their location. The three anterior sutures form one group, the three posterior sutures one group, and the two lateral sutures are tied together, a pair on each side, making four groups in all (Fig. 7). A uterine tampon of iodoform gauze or wicking is now inserted by means of this forceps and tampon carrier (Fig. 8), a projecting strand being attached to the vaginal gauze tampon in order that both may be removed without undue disturbance of the parts. If no accessory work is done the usual perineal dressings are applied and the patient put to bed. The external genitals are bathed with antiseptics after micturition, but no douching of vagina or disturbance of tampon is allowed until the second or third day, when the entire tampon is removed and not replaced. Vaginal douches of 1 to 4000 bichloride are then used twice daily. The sutures, unless catgut is used, are removed at the end of two weeks, when the patient can be up.

The advantages of this method are:

1. Quickness and ease of operating by the knife here presented, the manner of making the flaps, transcending, in certainty and safety of execution, the ordinary methods of excision.

2. Clean, smooth-cut surfaces, obtained without haggling of tissue.

3. The easy approximation of flaps and the avoidance of all hæmorrhage beneath them by deep placing of suture and compression of the flaps.

Fig. 9. Excised cervical tissue.

4. The accurate approximation of mucous membrane to mucous membrane, thus avoiding granulating surfaces, formation of cicatrix, and constricting of the canal. (This feature, which also pertains to Schroeder's operation, is of great importance and a decided advantage over trachelorrhaphy, especially where the entire mucous membrane is removed.)

5. The certainty of obtaining a permanently patulous canal and a well-formed cervix with pronounced reduction of the hyperplastic uterus.

6. The simplicity of the after-treatment.

7. Its adaptability to nearly all cases where removal or plastic surgery of the lower segment of the uterus is indicated.

CHRONIC INFECTIVE TENOSYNOVITIS

Report of a Most Interesting Case

By W. W. GRANT, M. D., Denver, Colorado

SIMPLE circumscribed cyst, usually affecting the tendon sheaths on the back of the wrist, is a simple affection, generally single, the contents being a thick liquid resembling quince juice in appearance and consistency. It is commonly designated a ganglion. Its treatment is simple and will not be further considered.

Acute infective inflammation of the tendon sheaths is usually due to trauma, or is secondary to adjacent disease of the bones or joints, or may be due to a general septic condition. It is frequently multiple. If suppuration results, it is a serious condition and requires free incision and drainage. The chronic disease is most interesting, and, when

Two weeks after operation.

Three months after operation.

several tendons are extensively involved, is rather unusual. It may be a sequel to the acute affection, but not necessarily so. It is always a serious menace to muscular function, and sometimes dangerous to life. The chronic infection of the tendons and sheaths of the forearm and wrist, especially, is believed to be due generally to tuberculosis, and is called compound ganglion or tuberculous thecitis. Gonorrhœa, syphilis, gout, etc., are in the etiological list.

The following case is the most extensive that I have yet seen, involving all the most important flexor muscles of the hand, the flexor carpi ulnaris, the flexor carpi radialis, the flexor sublimis, profundus digitorum and flexor longus pollicis.

Sam Branum, colored, aged 53 years; occupation for the past fifteen years, janitor of the First National Bank of Denver, Colorado. His occupation required the constant daily use of his hands in manual labor. Five and a half years before calling on me, the fingers of the left hand were affected, though not severely, with what was called rheumatism. This condition gradually extended, in the course of a year, to the front of the wrist and forearm. Although mild, the disease was progressive, extending slowly to the palm and up the arm, at times remaining stationary. It continued in this way with slight pain, at times, and swelling, gradually increasing until January, 1911, when the pain, swelling and fever increased rapidly, completely disabling the hand and arm in the course of a few weeks. This was the condition when I first saw him. The hand was absolutely helpless, with some anæsthesia, due doubtless to pressure. His fingers were in a state of partial flexion and he was unable to flex or extend them in the slightest degree.

Examination showed the palmar surface of the hand and arm greatly swollen, the fingers (except the thumb) not seriously involved in the swelling, and the constriction of the annular ligament making a sharp line of distinction in the appearance of the hand and arm. Pressure and manipulation revealed a soft, doughy feeling and deep fluctuation from the arm to the palm and thumb. The extensor muscles were not involved in the slightest. He states that he had syphilis thirty years ago, for which he was indifferently treated for about a year.

Operation at St. Luke's Hospital on March 18, 1911. A central incision was made through the skin and deep fascia from the upper third of the arm to the middle of the palm and a connecting incision to the distal phalanx of the thumb, following the course of the flexor longus pollicis, which was infected and enormously distended throughout its entire extent.

There were no adhesions between fascia and tendons, but the latter were adherent *en masse* and the veins greatly engorged. The annular ligament was divided, the tendons treated separately, the thickened distended sheath of each split throughout its length and trimmed with scissors. Each sheath was distended with a thick, grumous, odorless material resembling yellow cornmeal gruel. In the belly of the sublimis digitorum there was a circumscribed cyst containing about a tablespoonful of this material, the capsule or membrane being almost as rigid and thick as cartilage. No rice bodies peculiar to tuberculosis were found. There was a similar mass in the palm with thin capsule, not in direct communication with a tendon. Some tendons were softened by a degenerating process. The capsule and the material from cysts and tendon sheaths were delivered to a pathologist for examination, whose report follows:

"Sections from the tissues removed from the wrist of Mr. Branum showed a general necrosis of the tissue. The contour of the muscle bundles and adjoining connective tissue could barely be discerned, the whole field presenting an almost homogeneous mass, except for numerous collections of small round cells of the lymphocyte type. There was no sign of any tubercle formation or anything

resembling giant cells. Nor were any tubercle bacilli found in sections specially stained for that micro-organism. The Wassermann reaction, made on two separate occasions a month apart, was negative.

"Histologic diagnosis: Necrosis of tissues due to an infection, the exact nature of which could not be ascertained. Philip Hillkowitz."

During convalescence, patient was given iodide of potassium and mercury alternately. The condition may have been due to syphilis, notwithstanding a negative Wassermann.

The wound was thoroughly irrigated and mopped with peroxide of hydrogen and salt solution. The carpal joint was not implicated. The annular ligament was sutured separately and the wound closed, with the insertion of a few small iodoform gauze tents here and there, as shown in photograph No. 1, taken two weeks after the operation. The wound was dressed with sterile gauze and bandage. A mild elevation of temperature followed for four or five days, with a slight discharge of pus from the wound, chiefly in the vicinity of the wrist joint. Gentle, passive motion of the fingers, hand and arm was instituted a week after the operation and continued with increasing vigor for four months, with the object of limiting the adhesions as much as possible. The swelling and discharge gradually subsided and the discharge practically ceased at the end of two months. The fistulous tracts were irrigated daily with strong iodine solution and finally treated with bismuth paste, to which was added balsam of peru. At the same time, the Bier hyperæmia treatment was applied one hour daily, above the elbow, for three weeks. Three months after the operation the patient was discharged perfectly well, with arm and hand well shown in photograph No. 2.

At the present time the wrist motion is almost normal, though it still creaks a little on extreme flexion. Flexion of the middle and ring fingers is excellent, but in the second and distal phalanges of the index and little fingers, and the distal phalanx of the thumb, the flexion is practically lost, due either to sloughing, or to powerful adhesions of the deep fibers of the flexor sublimis digitorum, and the flexor longus pollicis. The thumb is easily abducted, as shown in the illustration, and with good flexion of all metacarpophalangeal joints and almost normal flexion of the middle and ring fingers, the patient has a very useful hand. While it could probably be improved by plastic tendon operations, he is so well pleased with the result that he is not anxious to submit to further operative procedures.

With negative examination, and tests for tuberculosis, including the skin test; with a negative clinical history of tuberculosis and a negative Wassermann; with a probable positive clinical history, many years ago, of syphilis; with no open wound infection, and no proven trauma, unless that which may come from the pressure and strain of occupation, I do not believe any positive assertion can be made as to the etiology. There is no history of gonorrhœa, nor of gout. For many years preceding his recent illness, he was a free drinker, sometimes to intoxication. Whatever the influence of alcoholism on the Wassermann reaction; whether it inhibits, as some believe, or makes one more sensitive to the test, as Sarbo and Kiss recently claim, the patient was neither drinking nor taking medicine when the last Wassermann was made.

The statement of these writers that "neither therapeutic nor prognostic conclusions can be drawn from the Wassermann reaction alone" is interesting, and the suggestion might, with propriety, be extended so as to include the question of diagnosis. With one tendon involved, or in compound ganglion of limited extent, adjacent fascia might be used, as has been suggested, to envelop and protect the tendons from vicious adhesions; but in extensive, multiple tenosynovitis with an extensive infection with suppuration, no method with this object in view would likely succeed, but *after* recovery, resulting adhesions may be remedied by fascial flaps with a fixed point, or by transplantation of fascia, as experiments have *shown* this to be entirely feasible.

SOME END RESULTS OF INTESTINAL STASIS IN CHILDREN

By L. E. BARRINGTON-WARD, M. B., F. R. C. S., London, England
Resident Medical Superintendent, Hospital for Sick Children.

INTESTINAL stasis in adults is now generally accepted as a well-defined clinical entity. The stasis itself is easily recognized and its secondary results are no less evident.

This constipation and auto-intoxication are by no means uncommon in children, but in children, owing to a variety of factors, the end results of the stasis rather tend to fill the picture, and it is not until one looks into it more carefully that the background of intestinal stasis is discovered.

Under Mr. Arbuthnot Lane's direction we have carried out numerous investigations at the Hospital for Sick Children, Great Ormond Street, London, into such conditions as tuberculous joint disease, rheumatoid arthritis, Still's disease, ulcerative colitis, appendicitis, etc., and have found evidence, both from the general condition of the patient and from the examination of the alimentary tract by the X-rays, of intestinal stasis in all these cases. Moreover appropriate treatment has been followed by the most beneficial results.

These children who are the subjects of intestinal toxæmia, whatever their secondary manifestations may be, present certain features in common which may be readily recognized.

By disposition they are either dull and lethargic, or querulous. Intestinal stasis is incompatible with alertness of mind or body.

Physically they are thin and weakly; their metabolism is feeble. Increase of weight is the surest sign of the cure of the stasis.

Except in the very fair complexioned, skin staining is always evident, especially in certain parts of the body — the neck, axillæ, flanks, and the flexures of the limbs. There is also a tendency to evil smelling perspiration.

The circulatory system suffers from the general poisoning, and coldness and blueness of the extremities are found to be fairly constant signs.

The frequency or infrequency of the motions is an unreliable measure of the proper functioning of the intestinal tract. It would be as reasonable to lay stress on the overflow of the urinary bladder in over distension of that viscus as a measure of the activity of the kidneys.

The true condition may be ascertained by the comparison of their bismuth photographs with those of normal children.

In the normal child the bismuth is passed in 24 to 30 hours: if stasis is present it may take from 50 to over 100 hours. In one case of tuberculous disease of the hip, the bismuth lay in the intestines for 160 hours.

It is not surprising to find that, when a child is so saturated with toxins as to show quite definite mental and physical characteristics, its tissues are devitalized and form a ready developing ground for a variety of organismal and degenerative changes.

The association of toxæmia with rheumatoid arthritis is no new idea, but it has been possible to show that the intestinal drainage is defective in this disease and that appropriate treatment directed towards the underlying cause is effective.

The bismuth photographs of a case appended show stasis for 52 hours. The patient a female, age 10½, was admitted to the Hospital for Sick Children in October, 1911, suffering from advanced rheumatoid arthritis of two years' duration. She had been treated elsewhere with X-rays and massage, without benefit. She was a toxic, unhealthy looking girl with very obvious pigmentation in the usual situations. She was unable to walk and lay with the limbs flexed in bed. All the joints were enlarged. The occipito-atlantal, cervical, and lumbar joints were firmly ankylosed, as also were the interphalangeal joints of the left hand. Both hips, both knees, the temporo-maxillary, and the remaining interphalangeal joints were partially ankylosed. It was impossible to extend the legs. There was slight general enlargement of the lymphatic glands.

A fortnight after admission, Mr. Lane

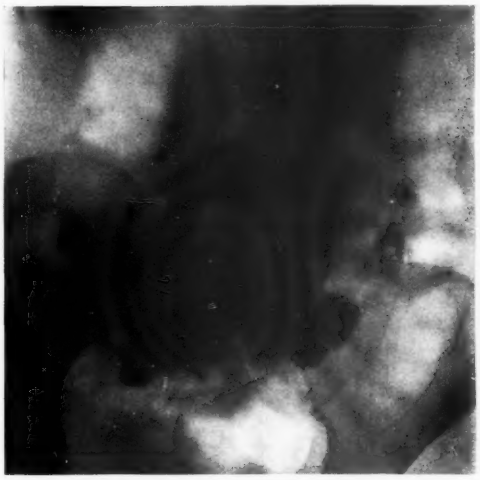


Fig. 1. 4 hours after bismuth meal.

Fig. 2. 12 hours after bismuth meal.

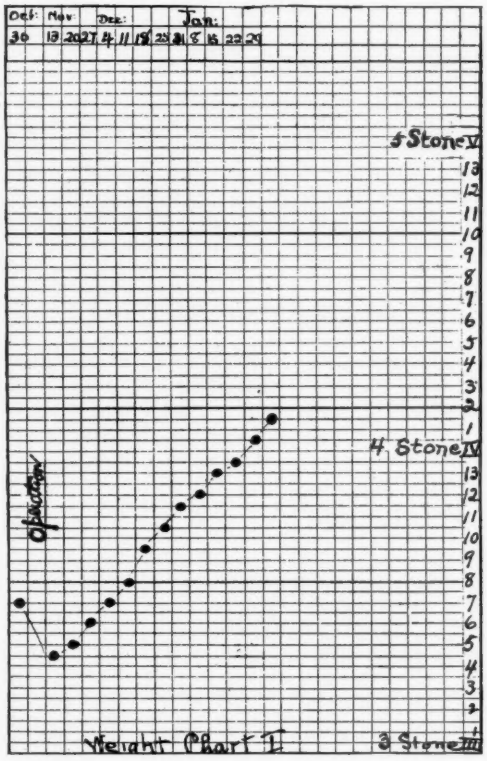
Fig. 3. 28 hours after bismuth meal.

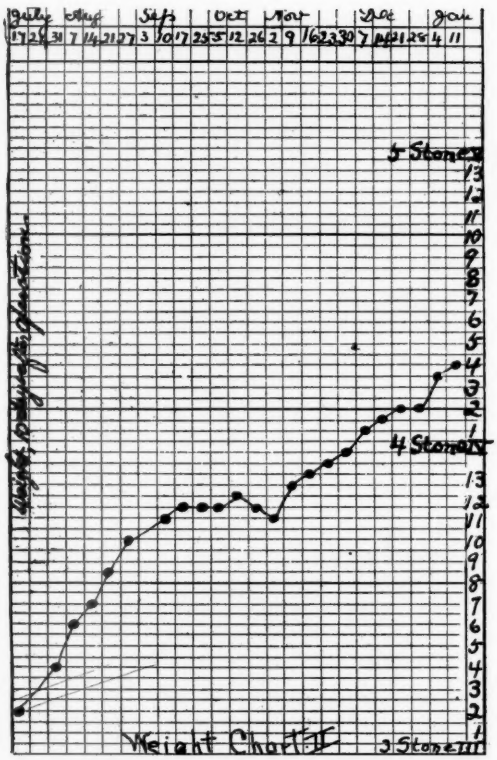
Fig. 4. 52 hours after bismuth meal.

Bismuth radiographs of a case of rheumatoid arthritis in a girl aged 10½, showing stasis.

opened the abdomen, divided the ileum, and implanted it low down into the pelvic colon. There was a well marked kink of the pelvic colon, (Lane's 'last kink') produced by a strong adventious band which involved the left fallopian tube and ovary also, and bound the structures to the posterior wall of the pelvis.

Recovery was rapid and uneventful and improvement began at once. There was a constant increase of weight (see chart I). The appetite greatly improved. The staining





entirely disappeared, and at the present moment (3 months later) she is a bright healthy-colored child.

She has recovered full use of her limbs, can walk quite freely without fatigue. All the joints have recovered their function with the exception of the cervical and occipital which are still firmly ankylosed and the temporo-maxillary which has not yet attained full range of movement.

The only treatment apart from the attention directed towards the alimentary canal, has been rest in bed with massage and weight extension to overcome contractures. The remarkably successful result can be laid to the credit of the ileo-colostomy operation.

Tuberculosis is another end product of intestinal stasis.

In children at least, infection by the bowel is the common source of tubercular disease, and can readily occur when the alimentary contents are stagnant and the absorption channels are already loaded with poisons.

The devitalized connective tissues form a ready nidus for the development of the bacillus and tuberculous joint disease is the all too frequent result.

The vast majority of cases of tuberculous joints will show not only the general evidence oi intestinal stasis but also delay in the passage of the intestinal contents on radiographic examination. The bismuth photographs are reproduced of a case of tubercular disease of the hip, subsequently treated by a short circuit operation with marked benefit.

It is found that if the radical cure of the constipation is effected, the general improvement begins at once—the skin becomes clear, the mental condition becomes bright, the appetite improves, the weight increases (chart II), and the joint lesion undergoes steady and progressive improvement. As an

Fig. 5. 8 hours after bismuth meal.

Fig. 6. 12 hours after bismuth meal.

Fig. 7. 36 hours after bismuth meal.

Fig. 8. 60 hours after bismuth meal.

Bismuth radiographs of a case of tuberculous hip disease in a boy aged 5, showing stasis. (See also Figs. 9, 10 and 11.)

illustrative case of many I will quote the following.

The patient was a female, aged 5 years on the occasion of her first admission to the Children's Hospital in 1907. In spite of the usual treatment of immobilization and rest in the open air the tuberculous disease of the hip progressed and one month later an abscess having developed, an arthrectomy was performed. She was sent to a convalescent home for a time but had to be re-admitted on several occasions for operative treatment.

In 1909 the right hip became diseased also and the left was so riddled with sinuses that permission was obtained for amputation. Intestinal stasis was so evidently present, however, that a short circuit operation was performed on the intestines instead.

The result was all that could be desired. The stasis was relieved, the weight increased, the sinuses

Fig. 9. 76 hours after bismuth meal.

Fig. 10. 100 hours after bismuth meal.

Fig. 11. 124 hours after bismuth meal.

healed, and the tubercular disease of both hips became quiescent and she has required no further treatment since.

Several other diseases could be cited which have chronic intestinal stasis as their predisposing cause. Of the more obvious, appendicitis, colitis, and pyelitis are good examples.

In every case of recurrent appendicitis that we have examined with bismuth radiography, stasis has been present.

Infection of the urinary tract in children with the B. Coli Communi is always due, I believe, to the same cause. Obvious constipation is generally present in these cases (Jeffreys, Quarterly Journal of Medicine, April, 1911), and moreover infection of the right kidney is more often found than of the left. This is exactly what we should expect with the greater degree of stasis present in the cæcum. Moreover, in some of these cases chronic appendicitis and pyelitis have been shown to co-exist and it is not unreasonable to urge that both have probably been due to the same cause.

With regard to the treatment of stasis in the early stages before it is too firmly established, general dietic measures can be adopted. Of drugs there is none that can compare with the liquid paraffin of the British Pharmacopeia. It acts mechanically, does not irritate the bowel, and ensures a regular and complete evacuation. The improvement in both adults and children after a course of paraffin internally is most convincing.

If, however, the condition is farther advanced and gross adhesive changes have occurred, stronger measures have to be adopted. Mr. Lane is accustomed to exclude the large bowel by detaching the ileum and anastomôsing it to the pelvic colon and the result has been satisfactory. Children even so young as two years bear the operation remarkably well.

BILATERAL RESECTION OF THE JAW FOR PROGNATHISM

Report of a Case

By WILLIAM M. HARSHA, M. D., Chicago

PATIENT, F. O. J., aged 22 years. Family history: no ancestors known to have had similar deformity. Father and mother were second cousins. One brother of eleven years has similar deformity in less degree.

Personal history: No serious illness; fell on his face in early youth, but parents say lower jaw was, at that time, already over-developed. Deformity developed gradually until puberty, when it soon became more pronounced, increasing until the patient was eighteen years of age.

Examination: Height, 6 feet; weight, 130 pounds; good muscular development. Inspection showed a very prominent chin, with especial over-development of the mental portion (Fig. 1).

The lower incisors receded sharply, but with the mouth closed were about ¾-inch beyond the upper incisors (Fig. 2). The arch of upper jaw was contracted with high arched roof of the mouth (Fig. 3).

There was no angle to the mandible, but a slight curve equal to an angle of 150 degrees. There was no proper "articulation" of the upper and lower teeth (Fig. 4). Speech was interfered with and mastication very difficult. The last lower molar, which was the second (the third never appeared) was about ¾ of an inch in front of the last upper (also the second) on the left side, and ⅝-inch on the right (12). His first concern seemed to be to have the deformity remedied.

A skiagraph showed (Fig. 5) a space behind the last lower molar and in front of the ramus sufficient in extent to permit of resection without removal of a tooth. The patient was referred to Dr. Joseph Eisenstaedt for the making of a model and such other orthodontic consideration as might be necessary, and which he will explain.

We decided upon the removal of a rhomboid section with greater width above, so as to make a normal angle to the jaw and secure parallel articular planes between upper and lower teeth, and proper occlusion (Figs. 6 and 7).

Operation May 10, 1911, at clinic at College of Physicians and Surgeons; ether anæsthesia (nasal) by Dr. Dagg. Longitudinal incision beneath the border of the jaw two and one-half inches long. Detachment of periosteum, clearing the jaw throughout its circumference for more than one inch. Bone-cutting forceps and rongeur were used cautiously

Fig. 1. Right profile of patient before operation.

Fig. 2. Showing upper right cuspid in lingual occlusion with lower first molar.

Read before the Chicago Surgical Society, February 2, 1912. (See discussion on p. 130.)

Fig. 3. Shows high vaulted palate, constricted upper dental arch and lingual inclination of all the lower teeth.

until we reached the inferior dental nerve, which was held out of the way by a thread, while cutting away the upper portion of the segment. Two wire sutures were placed so as to permit of slight mobility, but with good apposition of fragments. Same on both sides. Wounds closed and sealed. Three-fourth inch shortening on left side; 5/8 on right.

We then tried to get the upper and lower molars separated slightly, and Dr. Eisenstaedt wired the teeth by Dr. T. L. Gilmer's method so as to bring the articular planes parallel. This brought the distal portion below the level of proximal at site of wiring (Fig. 8).

Union was by first intention as to soft parts, but before the end of a week, or about that time, the patient was called home suddenly by a serious illness in his family, and we were unable to make any further adjustment or readjustment. He reports by letter (as we could not get him back) that union was complete in four or five weeks. The wires were removed too soon by his home dentist and evidently the bones were displaced before the union was complete, as the molars would not allow of perfect closure, and he had two drawn and one or two others filed off. Says he now can chew well, talk better and is satisfied with the results, which he concedes could have been improved if he had stayed here. His present appearance is shown in Fig. 9. The etiology is not clear. Probably hereditary tendency is most important.

The advantages of the extra-oral route are obvious. Not every case of prognathism may, however, present sufficient space between the ramus and last molar for resection.

In case it is necessary to remove any teeth, preferably the last molars, they should be drawn long enough before operation for healing to take place and render submucous resection possible. By saving the inferior dental nerve the integrity of the teeth is preserved.

The co-operation of the dental surgeon is essential if the general surgeon undertakes this work; as the problem of occlusion

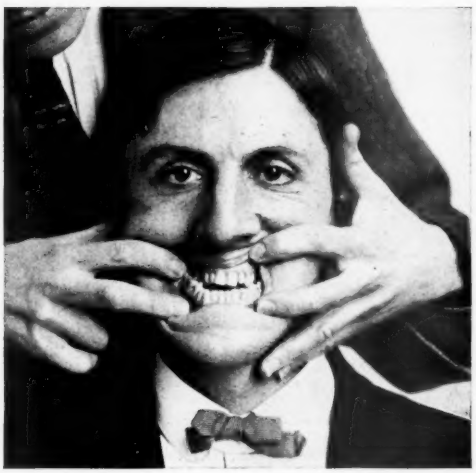


Fig. 4. Front view of occlusion, showing telescoping of the upper teeth by the lower teeth.

Fig. 5. Skiagraph showing over development of mental portion of body of mandible and under development in region of angle with absence of third molars.

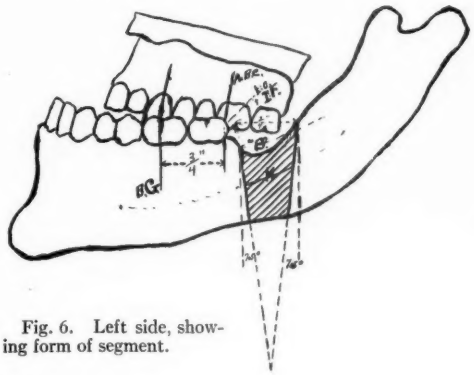


Fig. 6. Left side, showing form of segment.

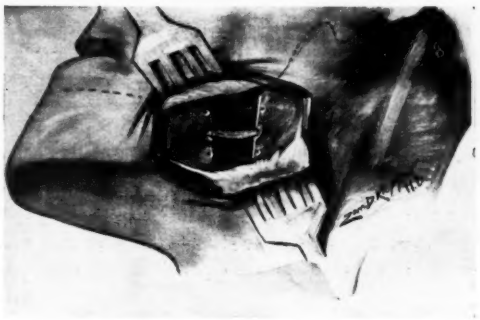


Fig. 7. Operative field showing space left after removal of bone segment with dental nerve in place.

of the teeth is of paramount importance. Preliminary spreading of the upper teeth in our case would have added to benefits derived, but was impossible to accomplish because of patient's unwillingness. Dr. Hullihen, of Wheeling, West Virginia, did an intra-oral operation for correction of prognathism in 1848. (Babcock in Items of Interest, xxxii, p. 442.)

Intra-orally a V-shaped piece was cut two-thirds through to the jaw from above, the distal fragment cut free, or partly free, horizontally and displaced backward. In 1897 Dr. Angle of St. Louis recommended operation, and Dr. E. P. Blair did a resection between the first molar and second bicuspid on one side, and nearly the same on the other side, extra-orally. It is stated that suppuration and necrosis delayed union nine weeks and then a fair result was obtained. Some further operations of this kind were done and one patient in New Orleans was said to have lost his lower jaw following the operation.

Successful operations have been done from without, resecting a portion of the ramus of the jaw, by Dr. W. Babcock, of Philadelphia. (Items of Interest, xxxii.)

Dr. Eisenstaedt has kindly co-operated with me in this case and will follow with an excellent review of the dental considerations.

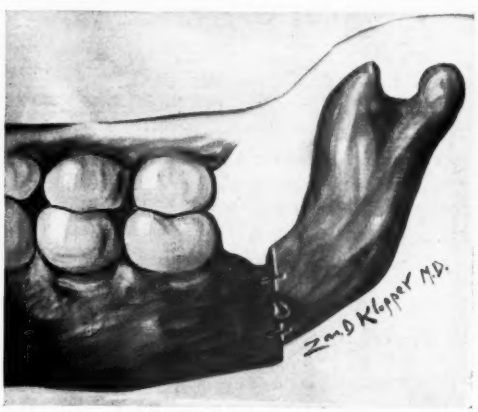


Fig. 8. Shows relation of fragments, after being wired, with occlusion of molars and new mandibular angle produced.

Fig. 9. Taken January 22, 1912, eight months after the operation.

BILATERAL RESECTION OF THE MANDIBLE POSTERIOR TO THE SECOND MOLARS, FOR CORRECTION OF PROGNATHISM[1]

By JOSEPH EISENSTAEDT, M. D., D. D. S., Chicago

IN presenting this case of malocclusion and facial deformity whose nature involves the subject of orthodontia, with which I am led to believe most of you are not well acquainted, I have deemed it necessary to first make a few explanatory remarks concerning the essential principles of normal occlusion and classes of malocclusion, before dealing with the diagnosis, indications for treatment, and methods of treatment, generally considered from an orthodontic standpoint.

Briefly, normal occlusion is that relation of the teeth and their arches wherein the greatest harmony and interdigitation of the teeth make for the best possible mastication and mutual support of the teeth.

The key to normal occlusion is the relative position of the six-year molars. This requires that the anterior-buccal cusps of the upper six-year molars lie within the buccal grooves of the lower six-year molars when the teeth are in apposition to each other, or in normal occlusion (see MBC and BG Fig. 10).

Malocclusion is the perversion of normal occlusion, and we have therefore to deal with the perverted elements bringing about a deformity such as we are considering. This I will speak of more in detail under diagnosis.

The principal forces controlling normal occlusion are:

1. The inclined planes of the cusps, which direct the position of the teeth during eruption and maintain their alignment.

2. The lower dental arch, wherein the teeth erupt first, exerts a controlling influence over the upper dental arch and the position of its teeth and their alignment.

3. Muscular pressure by the tongue, from the inside, and the lips on the outside, greatly influence the harmony and relation of the dental arches, as well as the muscles of mastication which close the jaws, i. e., the masseter, the internal and external pterygoid, and temporal muscles.

According to Dr. Angle's classification, there are three classes of malocclusion.

The first class is characterized by the normal mesio-distal relationship of the six-year molars, accompanied by a reduction of size in the dental arches and the bunching or overlapping of the six anterior teeth, either in the upper or lower arches or both.

The second class is characterized by all the lower teeth being in distal occlusion or in posterior relationship to the upper teeth. This class has two divisions, each having a sub-division.

The first division is characterized by a narrowing of the upper dental arch, accompanied by lengthened and protruding incisors, abnormal lip function, nasal obstruction and mouth breathing. Its sub-division differs only in that but one half of the lower arch is in distal or posterior occlusion.

The second division cases have less narrowing of the upper arch, lingual inclination of the upper incisors with bunching of the same, but associated with normal nasal and lip function. Its sub-division differs from the main division in that one half of the lower arch only is in distal or posterior occlusion.

The third class. Here we have the lower teeth and arch in mesial occlusion, or anterior relationship to the upper teeth, associated with lingual tipping of the lower incisors and canines, due to the pressure of the lower lip in its effort to close the mouth. This class has one subdivision whose characteristic is recognized by only one half of the arch being in mesio-occlusion.

EXAMINATION

Examination of the mandible, speech, nose, throat, mouth caries and occlusion of the case in question, revealed the following:

1. The absence of any mandibular angle. See X-ray print (Fig. 5).

2. That a line, drawn from the condyles

[1] Read before the Chicago Surgical Society. February 2, 1912. (See discussion on p. 130.)

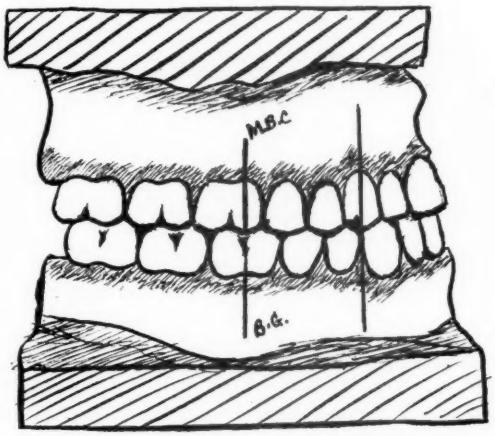


Fig. 10. Relation of teeth in normal occlusion.

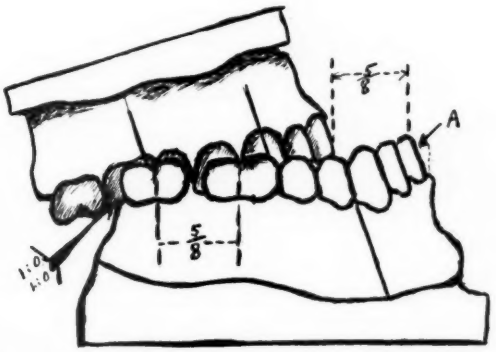


Fig. 11. Right side, showing amount of anterior or mesio-occlusion.

to the tip of the chin was almost straight, and parallel with the posterior border of the ramus and the inferior border of the mandible, giving the jaw an angle of 150° (see Fig. 6).

3. A prominent over-development of the mental portion of the body of the mandible (see Fig. 5).

4. A high-vaulted palate and constricted dental arch (see Fig. 3, plaster models).

5. The incisal edges of the upper central incisors were 5/8 of an inch posterior to the incisal edges of the lower central incisors (see Fig. 11).

6. All the teeth are present but the four third molars or wisdom teeth (see X-ray, Fig. 5).

7. All the teeth of the lower jaw incline greatly toward the tongue, and the anterior teeth, particularly, have a posterior inclination of 45° (see Figs. 11 and 12).

8. The examination for caries of the teeth revealed nine approximal cavities; these cavities were filled with cement and the teeth carefully cleaned before the operation.

9. Inhibited speech; all dental, labial and palatal sounds were markedly incomplete.

10. Marked depression of upper lip (see Fig. 1).

11. Marked thickening of lower lip (see Fig. 1).

12. Alae of nose depressed (see Fig. 1).

13. No mouth breathing.

14. Slightly enlarged tonsils, but no nasal obstruction.

ETIOLOGY

The contributing causes of this class of malocclusion, or prognathism, are, in the main, obscure, owing to the fact that the forces at work are of a progressive and intermittent character.

A. We have recognized the habit, in some patients, of advancing the lower jaw during mastication in order to avoid pain incurred by pressure brought to bear upon the pulps or sensitive carious cavities in the upper six-year molars.

B. Some slight mesial or anterior protrusion has been brought about by the destruction of the crowns of the upper six-year molars by caries, resulting in the tipping forward of the lower six-year molars.

C. However, the essential characteristic of these deformities is manifested by a marked

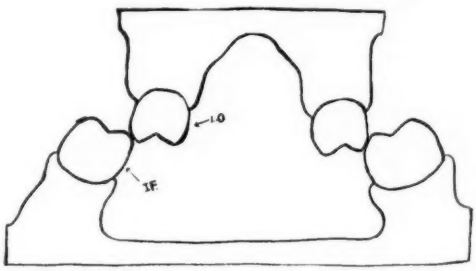


Fig. 12. Infra- and linguo-occlusion of upper teeth.

Fig. 13. Shows area of occlusal contact only between upper left bicuspids and lingual cusps of lower molars.

over-development of the body of the mandible, which was present in our case.

D. Furthermore, it may be said that the presence of enlarged tonsils in these cases has developed a tendecy on the patient's part to advance the lower jaw while swallowing, and also to relieve tension bearing upon the anterior and posterior pillars of the fauces.

E. Finally, we may believe hereditary forces to have been at work, in view of the fact that the patient's parents are cousins, and that a similar deformity is borne by two of the patient's brothers.

DIAGNOSIS

Orthodontic. This case belongs to Class 3, according to the previous classification mentioned, in that,

First, the lower arch and teeth are in mesial occlusion, or anterior relationship, to the upper dental arch and teeth, to the extent of 5/8 of an inch (see Fig. 11).

Second, the buccal groove of the lower left six-year molar is 3/4 of an inch anterior to the basal line passing through the antero-buccal cusp of the upper left six-year molar (see Fig. 6, ABC and BG), equal to the width of two bicuspids.

Third, on the left side, the upper six-year molar is in lingual occlusion and infra-occlusion in relation to the lower left second molar (see Figs. 6 L:O and I:F and 12, LO).

Fourth, that the upper molars on the right side are also in lingual and infra-occlusion in relation to the lower second bicuspid and molars, with 5/8 of an inch protrusion of the lower six-year molar (see Fig. 11, L:O; and I:O).

Fifth, on the left side the buccal cusps of the upper bicuspids occludes with the lingual cusps of the lower molar; this is the only plane of occlusal contact between the teeth (see Fig. 13).

PATHOLOGICAL DIAGNOSIS

This is a congenital and acquired deformity of the mandible, due to the following factors:

1. An over-development of the mental portion of the body of the mandible, due to muscular pressure from the lips in endeavoring to close the mouth (see X-ray, Figs. 5 and 1).

2. An under-development of the upper dental arch, associated with high-vaulted palate and a narrowing of the lateral halves of the dental arch (see Fig. 3).

3. A telescoping of the upper arch by the lower dental arch, due to the masticatory muscles, resulting in pressure being brought to bear against the angle of the jaw, giving same an obtuse inclination, or flat angle, in the effort to bring the teeth into occlusion (see Figs. 13 and 11).

4. A marked under-development of the mandible in the region of its angle (see Fig. 5). This may be attributed to the inability of the masseter muscle to be used in mastication, on account of the infra and mesial occlusion, resulting in its partial atrophy.

TREATMENT

Orthodontic. These cases of malocclusion, or prognathism, unfortunately do not come to the dentist or orthodontist early enough. If they did, surgical interference would not need to be resorted to at all.

THE METHOD OF TREATMENT DETERMINED BY THE AGE OF THE PATIENT OR CALCIFICATION OF THE MANDIBLE

Up to the age of 15, these deformities are not as pronounced as after the age of 20. In middle age, nature slightly corrects the facial disproportion by the addition of weight and distribution of fat tissue in the region of the

mandibular angle. It is during the stage of adolescence and completion of the second dentition that orthodontic treatment is successful, and should therefore be instituted as soon as the first sign of mandibular over-development may be detected by examining the occlusion of the teeth. Briefly, the treatment consists of expanding the upper dental arch, moving the lower front teeth forward, if inclined lingually, and applying an intermaxillary device upon the upper second molar and lower six-year molars to force the patient to gradually move his lower jaw backward when masticating. This method is the reverse of the Baker form of anchorage, in that instead of traction being antero-posteriorly, it is made postero-anteriorly; this is accomplished by heavy rubber ligatures, as shown in Fig. 14.

This traction works every time the patient opens and closes his jaws, causing the absorption of bone in the region of the angle of the jaw. At the same time this traction by the rubber bands produces a more acute inclination of the mandible at its angle.

Regardless of the patient's age, a small amount of expansion of the upper arch at least, should have been done before the operation, in our case, for these reasons:

1. Expansion would have permitted much better accommodation for the tongue, which, without such a measure caused some unnecessary and temporary discomfort to the patient in speaking, and during deglutition, in view of the reduction in the floor of the mouth after resection of the mandible.

2. Much better occlusion would have been secured than we obtained, in that lingual occlusion of the right half of the upper dental arch would not have persisted as it did after the operation.

3. A more normal facial contour in the region of the canine fossæ would have been restored by expansion of the upper dental arch, as well as a wider floor for the nasal cavity, which would have also facilitated the patient's respiration.

4. The increased susceptibility of the teeth to caries from the crowding and malposition of the teeth themselves will have been greatly diminished by better cleansing of same during mastication, if better alignment of the teeth had been established by expansion of the upper dental arch.

5. Less bone would have had to be resected.

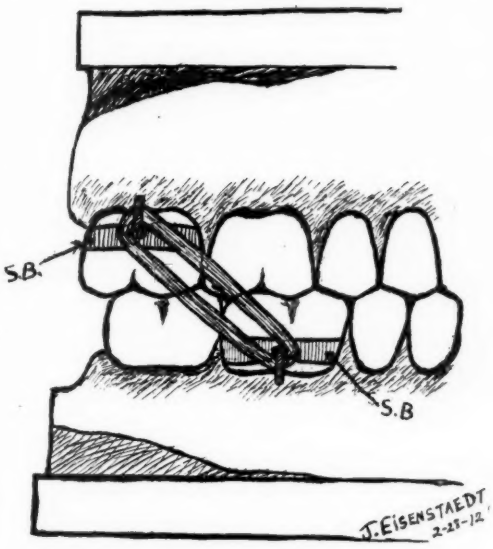


Fig. 14. Reversed intermaxillary anchorage.

INDICATIONS FOR SURGICAL RESECTION

While we may have moved the upper incisors forward by expanding the dental arch, we could not move the lower incisors likewise, and obtain harmony of proportion, between the lower and upper arches. In fact, had we done this without making a bilateral resection, we would have intensified the existing deformity by additional prominence of the middle third of the face. This would have resulted in producing an over-development in the canine fossæ, resembling the facial expression of the ape.

Most important of all, however, is the fact that with the calcification of the mandible already completed, the employment of orthodontic appliances could not accomplish much at the age of 22; for with what cusp relation and interdigitation that we could obtain, we could not afterwards permanently retain the position of the teeth.

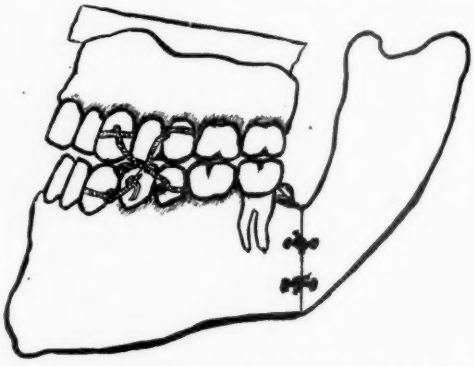


Fig. 15. Union of fragments by silver wire; method of immobilization and occlusion of teeth after operation.

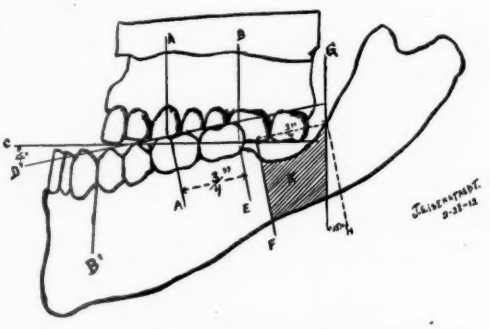


Fig. 16. View of left side — level with occlusal plane, i.e., line "D" — showing form and superior dimension of bone segment calculated from the difference between the occlusal planes of the upper and lower bicuspids and molars. (See discussion on p. 132.)

Accordingly it was concluded that no orthodontic treatment of the lower jaw and teeth alone could be sufficient. Therefore a bilateral resection was the only logical resort, both from an orthodontic standpoint, as well as from an anatomical basis.

CALCULATION OF THE BONE SEGMENTS TO BE RESECTED FROM THE AMOUNT OF INFRA- AND ANTERIOR PROTRUSION PRESENT

From the examination and measurement of plaster models and the X-ray plate, we found that on the left side, the lower teeth were ¾ of an inch and on the right ⅝ of an inch anterior to the antero-buccal cusps of the upper six-year molars (see Figs. 6 and 11).

These measurements we used as the respective superior or horizontal dimension of the segments of bone excised.

We recognized in the infra- and lingual occlusion of the upper teeth that we had to deal with the difference between two planes; in other words, the restoration of normal occlusal contact required that these planes be made parallel as well as that the ramal and body fragments be in coaptation, when wired. To do this, it will be readily seen from Fig. 6 that the body of the mandible must be lowered so that the lower molars and bicuspids will come into occlusion with their opponents above. At the same time, we must bring the lower cuspids, and incisors also, into occlusal contact with the upper front teeth.

In order to do what has just been stated, one may conclude that the form of the segments to be removed was the problem and key to the difficulty at hand. So sketches made upon paper, with the X-ray before us, finally led us to make a rhomboidal form as a pattern. Fig. 6 shows this pattern drawn upon the mandible in the region of the angle. Fig. 15 shows method of immobilization and occlusion after operation.

In conclusion, I wish to say, that I quite appreciate that all services possible by orthodontic treatment, were not rendered, owing to the patient's limited time and his sudden departure from the city.

Here, I wish to use this opportunity to express my appreciation for the courtesy extended by Dr. Harsha, asking me to present the orthodontic phase of this case to your society, and to congratulate the Doctor upon the satisfactory result obtained.

I also wish to express my gratitude to Frederick B. Noyes for his courtesy and assistance in procuring the photographs of the plaster models as well as for his cordial interest in the case.

RENAL VARIX

By PAUL M. PILCHER, A. M., M. D., Brooklyn, New York

AMONG the relatively large number of cases of hæmaturia which have come under our care during the past ten years there have been several which presented no other symptom than the presence of blood in the urine. However, the source of the hæmorrhage has been satisfactorily explained in each case. Of these, four were typical cases of renal varix, the history of one of which I will give in detail.

Case 1.- Patient referred by Dr. Harold Jewett; a man, aged 50 years. Malaria and scarlet fever as a child, no venereal history. Four years previous to examination, without known cause, his urine became dark red or chocolate colored. This discoloration of the urine lasted a month or two and then suddenly disappeared, and the urine became clear again.

Status praesens. The patient had been drinking heavily. In October, 1908, he noticed the return of his former condition. There was no symptom other than a large amount of blood in the urine. This was more marked in the morning on rising, and cleared up somewhat as the day progressed. There was some increased frequency of urination during the day. He was very nervous and lost considerably in weight. Physical examination showed his heart to be normal, his liver enlarged, but otherwise negative.

E xamination of the urine showed the specimen to be loaded with blood, the cells sinking rapidly to the bottom of the glass container and the supernatant fluid retaining its red color, showing the presence of free hæmoglobin.

Iron and quinine were administered in various forms; in November, the fluid extract of ergot, in one-half-dram dose every four hours, was exhibited. At this time the urine was still loaded with blood. Two days after he began taking the ergot, the urine became perfectly clear and remained so for two days; then it was more bloody than before. This continued for a number of days, and then, without any medication, the urine became clear again and remained so for a few days, but the blood reappeared. December 10, 1908, it was clear and remained clear the 10th, 11th, and 12th of December; then the blood reappeared and was present off and on until April, 1909. Cystoscopic examination showed blood coming from the left ureter. The writer presented the history of the case before the Brooklyn Surgical Society and made a clinical diagnosis of renal varix.

May 1, 1909, the patient consulted Dr. Hugh Young, of Baltimore. He also found hæmorrhage coming from the left kidney. He injected the pelvis of this kidney with three drams of a 1 in 500 adrenalin chloride solution. After a day or two the hæmorrhage stopped, and it did not return for about ten days. He returned to Brooklyn in the same condition as before.

January 11, 1910, cystoscopic examination showed the left ureter opening normal in appearance and secreting blood-tinged urine at regular intervals. Bacteriological examination of the urine from the left kidney was negative. The renal pelvi s was washed out with adrenalin chloride solution, in order to check the hæmorrhage temporarily.

Operation by the writer. At the end of a week the left kidney was exposed, and was found to be surrounded by a mass of fat and many fibrous bands, which bound the kidney down. These were separated with much difficulty. In order to bring the kidney up out of the wound it was necessary to resect the twelfth rib. The kidney was somewhat congested and enlarged. It was bisected along Broedel's line, and the pelvis and all of the calyces were opened. The papillæ at the upper pole of the kidney were congested and one of the lower papillæ showed on its surface minute varicosities, which gave it a roughened, granulated appearance, making it appear somewhat whiter than the other papillæ. After the kidney had been thoroughly inspected and the varicose and congested condition of the papillæ noted and demonstrated to a number of the surgeons who were present, the two halves of the kidney were brought together and sutured with two layers of mattress sutures, using No. 2 plain catgut. The capsule of the kidney was sutured with a separate catgut suture, a drain was inserted into the lower and central portions of the wound and the rest of the wound closed. The patient made an uneventful recovery, the blood disappearing completely from the urine within seven days after the operation. It is now two years since the operation, and although the patient has continued the daily consumption of a large quantity of whiskey, there has not been a trace of the blood in the urine since his recovery from the operation.

The history of all these cases is very much alike. The patient, usually in good health, suddenly notices the presence of blood in the urine. There is nothing to account for its presence; there has been no undue exercise, no injury, no infection and only occasional history of renal colic; no pus cells, epithelial elements, crystals, tubercle bacilli, or other abnormal ingredient found in the urine, other than blood, which is at first small in amount, then either increasing or decreasing, and

oftentimes absent altogether; in some cases the amount of blood is influenced by exercise, while in others this plays no part. In two cases of my own, the quantity of blood seemed to be greater in the morning and to lessen as the day advanced. It occurs with varying frequency in both men and women over twenty-five years of age. Some patients have had alcoholic habits, while others have been total abstainers; in fact, there is no type of person in whom the disease has been more frequently observed. The hæmorrhage may last but a few days only to disappear and recur again after periods of weeks or months, or even years, or again, it may be continuous from the first, causing progressive anæmia.

As a rule, the urine is loaded with blood, and, at times, with free hæmoglobin; the blood cells are evenly distributed throughout the urine, appearing in all parts of it as it is evacuated from the bladder; clots may be found in the ureter or bladder, to be expelled at intervals; as the specimen stands, the cells rapidly fall to the bottom of the glass container; and it has been observed in my own cases that the urine retains its reddish color after precipitation of the cells, probably due to free hæmoglobin.

The urine shows no evidence of renal disease other than a reaction for albumin in proportion to the amount of accompanying blood serum, excepting where nephritis is present, a condition which of itself may give rise to hæmaturia, but which should not be classed with these cases.

Rarely the patients complain of pain or distress in the affected kidney or over the bladder, but it has been observed in some cases that all of the pain and discomfort have been referred to the opposite kidney. The disease is always unilateral; and no cases, so far as I can learn, have ever been reported where the disease affected both kidneys. It is true that symptomless hæmaturia is frequently bilateral; but those are the cases due to malaria, hæmophilia, drug-poisoning, nephritis or other causes quite different from those included in the present report.

In the Annals of Surgery, May, 1909, the first report of my cases was set forth, together with a study of similar cases obtained from other writings.

Fenwick[1] of London first called attention to the occurrence of angioma or capillary nævous of a renal papilla as the cause of painless hæmaturia. He reported three cases in which distinct vascular abnormalities were found in one of the papillæ of the kidney; two of these cases were cured by papillectomy, and one by nephrectomy. In his first case, the vessels of the mucous membrane covering the papilla were markedly varicose; in the second case, a bright red varicose condition similar to the first case was found; in each, recovery followed removal of the affected papilla. In the third case, in which nephrectomy was done, a dark purple papilla appeared and a little blood was seen oozing from a point in the apex. He also reported three other cases, in two of which simple nephrotomy was done, followed by recovery; and one in which nephrectomy was done and the kidneys found to be the seat of subacute nephritis. In the three latter cases, no abnormal condition of the papillæ was definitely made out.

In March, 1908, Whitney and Cabot[2] reported a case in which the tips of one or two of the papillæ at one end of the kidney were reddened and a little spongy; the microscopical examination showed the small venules at the tip of the papilla irregularly dilated, and covered on their free surface with a fine film of connective tissue and a single layer of epithelial cells, projecting here and there as varicose knuckles; no well marked thrombi were found. The straight tubules of this region contained blood corpuscles, which were not found higher up, indicating this to be the source of the hæmorrhage. MacGowan[3] has also reported several interesting cases of painless hæmorrhage from the kidney which were relieved by operation.

During the past three years other cases have come under my personal care, which belong properly in this class:

CASE 2. Referred by Dr. William Moser. A man, aged 62 years, janitor by occupation, was admitted to the German Hospital of Brooklyn, on

[1] Fenwick, H.: Clinical Cystoscopy, London, 1904, p. 392.

[2] Whitney and Cabot, Boston Medical and Surgical Journal, vol. clviii, No. 21.

[3] MacGowan, Granville: American Journal of Urology, June, 1908.

August 26, 1908. Non-alcholic, had never suffered from scarlet fever, rheumatism, diphtheria or malaria. Has had bleeding hæmorrhoids for several years. In November, 1907, he first noticed blood in his urine; this was shortly after an attack of influenza, and there were no other symptoms referable to the genito-urinary tract, excepting some increased frequency of micturition: the hæmaturia was said to have been constant. The urine was constantly loaded with blood, and he often passed clots of blood; he would void his urine three or four times during the night.

In this condition he presented himself for treatment. He had an apathetic expression, and was anæmic rather than cachectic; the eyes were slightly sunken and watery; his temporal and radial vessels showed a very slight arterio-sclerosis; he stated that he had lost considerable in weight; his bleeding hæmorrhoids had caused him a good deal of suffering.

A rectal examination showed dilated hæmorrhoidal veins that were oozing. Cystoscopic examination showed some congestion about the mouth of the left ureter. Urine drawn from the left kidney was bloody, that drawn from the right kidney was clear. His condition became so grave that he at last consented to an operation. At this time his hæmoglobin was found to be 35 per cent. Morphologically, the red blood cells showed advanced poikilocytosis with marked anæmia; lymphocytes were all small. In this desperate condition he was subjected to operation on December 12, 1908, by the writer. A rapid nephrectomy was done without any seeming shock to the patient. Upon exposing the kidney it was found to be congested, and the pelvis was swollen with contained bloody urine; there were no macroscopic changes in the kidney itself. The patient reacted well from the operation. Twenty-four hours after the operation his condition was perfectly normal; the urine passed was clear, showing that the source of the hæmorrhage had been removed. At midnight he was sleeping normally, with temperature 98.4, Pulse 90, and respirations 30. Shortly after that it was noticed that his respirations were more rapid, his pulse becoming weaker; at 2 A. M. there was a sudden dilatation of the heart, and at 2.10 A. M. he died, forty hours after the operation.

Examination of the removed kidney showed it to be normal in size, the parenchyma was normal and no signs of nephritis were present; there was a small cyst in the cortex filled with clear fluid. Sections were taken from the papillæ, and a typical condition of varix was found; the numerous venous and arteriocapillary spaces were markedly dilated, so that in places there was but a thin wall of cells between a number of blood sinuses, and on the surface the sinuses approached so nearly the mucous membrane that the slightest violence would probably cause their rupture; a rupture of these, however, was not necessary, as a transudation of the blood cells and of the blood elements would be easy through so thin-walled a vessel if on an exposed surface.

It is emphasized that, macroscopically, nothing whatever was discernible in the kidney to indicate the varicose condition of the papillæ. I know of no previous case in which the condition has been proven to exist; all the cases reported, as already outlined, have shown macroscopic changes that drew the attention of the operator to one or another of the papillæ, and, in some cases, actually oozing points were seen. A more complete report of this case appears in the Annals of Surgery, May, 1909.

CASE 3. Referred by Dr. V. W. Weed. Woman, 28 years old. Four months previous to examination she discovered blood in her urine, evenly mixed with the same, and a few drops following the close of micturition; catheter specimen was bloody; there was never any colicky pain; two months ago she began to have some increased frequency of urination. Has lost twenty pounds in weight, and is steadily growing weaker; aside from this she does not complain of anything except the blood that she passed whenever she urinated; she stated that even after a night's rest the urine was as bloody as it was at the end of an active day.

Examination of the patient revealed a woman of slight build, moderately anæmic; heart and lungs normal; the right kidney was slightly enlarged, somewhat tender, and freely movable as far as the pelvic brim. The left kidney was slightly movable. Urine: specific gravity, 1.017; acid; trace of albumin; no sugar; blood cells. April 20, 1908, the bladder was examined and no point of hæmorrhage was found therein; urine that came from the right ureter opening was distinctly abnormal. Both ureters were catheterized and the urine obtained from the right kidney contained a small amount of blood; that from the left kidney was normal.

Operation, April 30, 1908, at the German Hospital. The kidney was found to be partially turned upon itself, without, however, any torsion of the ureter; the kidney was enlarged and its central portion seemed to be somewhat grayer in color than the two poles; a pedicle clamp protected by rubber tubing was used to compress the renal vessels. The kidney was then split from pole to pole, a little posterior to its median line, down to the pelvis; no abnormality of any kind could be found. The pelvis was carefully examined and was found perfectly normal in size and position; palpation of the kidney demonstrated no abnormalities. Four mattress sutures of catgut were used to bring the split surfaces of the kidney in due apposition and hold them there; the peripheral edges of the kidney were brought together with catgut sutures; after the clamp was removed—having been in place about four minutes—there was free oozing from the kidney and it was found necessary to put in a few additonal sutures. The kidney was then fixed to the muscular structures by four stay sutures of chromic gut, and the wound closed with the exception of an elliptical space 1½ inches long by ½ inch wide, which was

packed with iodoform gauze. The patient stood the operation very well; during the first twenty-four hours there was considerable oozing of blood and urine from the wound, but during the next twenty-four hours this entirely ceased. An uneventful recovery followed, the wound healing *per primam*.

On the fifth day after the operation there were no microscopic or macroscopic blood elements to be found in the urine. From that day until the present, now three and a half years, she has remained entirely well and has gained greatly in weight; she has never had the slightest trace of blood in her urine since the operation.

In considering this case, the first point worthy of attention is the fact that the blood has been present in the urine without intermission for four months; that it was just as bad if not worse in the morning as at night; that there was a considerable amount of free hæmoglobin present in the urine; that she was thoroughly anæmic rather than cachectic. No microscopical section was made in this case, and no removal of kidney tissue was done. The clinical condition found at operation and the complete subsequent relief to the bleeding, following the nephrotomy, illustrated in an ideal degree the characteristics of the lesion under discussion.

CASE 4. A man, 46 years of age. On April 2, 1911, first noticed a large amount of blood in his urine. There were no other symptoms at first but later on the same day he had some pain in the region of the left kidney. It resembled the pain arising from renal calculus. The next day a cystoscopic examination revealed a partly organized blood clot, blocking the left ureter opening. An X-ray examination was negative. April 29, 1911, the left kidney was exposed and bisected. The uppermost papilla showed tortuous venules just beneath the mucous membrane. The two halves of the kidney were brought together and held by mattress sutures. He made an uneventful recovery and at the present writing, he remains well.

There have been other cases which have come under my observation, which were not subjected to operation by the writer and although I feel sure that they were cases which belong properly in this class, I cannot include them among the proven cases.

In conclusion, I will give again the result of my study of these cases.

1. Renal varix is a distinct pathological entity, and may be described as an angiomatous disease of the papillæ renales, whose etiology and pathology resemble that of varicocele, varicose veins of the leg, varicosities at the cardiac end of the stomach, hæmorrhoidal varices, etc.

2. Many of the so-called cases of essential hæmaturia are due to this condition of the kidney.

3. It has its own distinct symptomatology; but it may be impossible to differentiate it, before operation, from hæmaturia due to nephritis and hæmaturia due to renal papilloma.

4. In the majority of cases, at operation, when the kidney has been bisected, no gross pathological lesions will be noted, but on microscopic examination of the papillæ renales a typical angiomatous disease will be found.

5. Renal decapsulation and fixation of the kidney will cure the cases of unilateral hæmaturia due to nephritis.

6. Nephrotomy is the operation of choice, because it allows a thorough examination of the kidney, and also for the reason that it accomplishes exactly what the operation of multiple ligature does in the treatment of varicosities in other portions of the body, in that six of the main connecting and collecting venous radicles of the kidney are severed and permanently closed and the course of the blood stream is instantly changed to the anastomoses at the upper and lower poles of the kidney, and in this way the varicosities are destroyed.

7. The incision should be made along Broedel's line, so as to avoid injury to the arteries.

8. Nephrectomy is indicated only when rapid bloodless operation is demanded, or when nephrotomy fails to relieve the hæmaturia.

HERNIAS OF THE OVARY, OF THE FALLOPIAN TUBE, AND OF THE OVARY AND THE FALLOPIAN TUBE

An Analytical Review of All Undoubted Cases of This Nature Reported in the French, German, and English Medical Literature from 1890 to 1910, Inclusive, with a Report of Unpublished Cases

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IN the female, the frequency of hernias, and especially of hernias of the internal genitalia, has been and is still underestimated. Owing to the lack of study heretofore given to this clinical entity, hernias of the uterine adnexa are often overlooked, not uncommonly misdiagnosed, and therefore subjected to injudicious treatment, harmful alike to the individual and to the hernial contents, prejudicial alike to the patient's general well-being and to her reproductive powers. Impressed by the clinical importance of the condition and surprised at the insufficient consideration given to the subject in even the most modern gynecological and surgical text-books, I have collected the following data, which may prove of service to some of my professional colleagues as well as to future investigators of the subject. Knowledge of the occurrence and familiarity with the symptomatology of a clinical condition lead to its more frequent and more timely recognition.

Soon after beginning the consideration of the subject, we became convinced that deductions and conclusions, to be valuable, should be based solely upon the study of cases whose accuracy of diagnosis is self-evident. Hence, the omission from the accompanying tables of all cases in which the hernial contents were not demonstrated at the operating, dissecting, or autopsy table. To further minimize sources of error, we analyzed only cases to the original reports of which we had access, that is, only such publications as can be found at the John Crerar Medical Library. Cases too meagerly reported or furnishing no data valuable to the development of the question were also discarded as their inclusion would not have influenced the conclusions embodied in the article. In Andrews (12) article are found cases antedating the period covered by us, and also some other cases, such as Cullen's case of tubo-ovarian hernia.

It is needless to state that hernias of the internal female genitalia occurring in individuals of the masculine gender or of undetermined gender were left out of our tables. Boeckel's patient (1), a Catholic priest, had a left congenital scrotal hernia from the sac of which there was removed at operation a mass which on examination was seen to consist of a Fallopian tube, a uterus, a ligament resembling the uterine broad ligament, and a testis bearing an epididymis with a distinct vas deferens. Upcott's case and those of like nature, I have endeavored to omit from the tables. Upcott's (11) case was an inguinal hernia of the rudimentary horn of the uterus and adnexa occurring in an infant with external genitals of an intermediate type.

Cases of supposed ovarian hernia in which microscopical examination of the removed hernial contents proved the herniated organ to be a testicle and not an ovary also called for elimination. Alexander (2) removed from a left-sided inguinal hernial sac in a female patient, whose vagina ended in a cul-de-sac, a mass which appeared to the naked eye to be ovarian tissue; microscopical examination showed that it was composed of testicular and epididymal tissues. In this patient, rectal examination did not reveal the presence either of a uterus or of uterine appendages. Kochenburger (3) reports a somewhat analogous case. His patient, thirty-three years old, of feminine build, had well-developed mammæ and pubes, but had never menstruated. She had been married for ten years; coitus was not painful. In each labium majus there was present a tender hernial swelling thought to be an ovary. The hernial contents were removed and micro-

scopical examination proved that they were testicles and not ovaries.

Finally, a group of anomalous hernias difficult of classification, and classified by many as hernias of the uterine adnexa, called for exclusion. Among these cases may be mentioned Walter's case (4), in which at operation a hard fist-sized hernial mass, present in the right inguinal region and extending into the labium majus and mons veneris, was found to be an accessory dilated cystic Fallopian tube; also Malherbe's case (5), often mistakenly referred to as one of tubal gestation occurring in a hernial sac. Malherbe in reporting this case says: "There is every reason to think that this was an empty hernial sac into which blood from a ruptured ectopic pregnancy had found access."

Lack of diligence on the part of authors leads to the vitiation of statistics; for instance, two of Koerte's cases (6) are often erroneously referred to as obturator hernias of the uterine appendages. Reference to Koerte's original article shows that the hernial sac in one case contained some hæmorrhagic fluid and a loop of congested gut; in the other case a small loop of gangrenous intestine was the sole hernial content.

We have conformed to the nomenclature in actual use; however, to better insure precision of classification and a more intelligent discussion of the subject, we define, at times, perhaps needlessly, the terms employed. The word hernia signifies the permanent or temporary protrusion of one or more viscera from their normal situation through a normal or abnormal opening in the walls of the cavity within which it is contained. It implies the existence of a hernial ring, of a hernial sac, of hernial sac contents, and of sac coverings. In the hernias considered in this article, the protruding organ was always either an ovary, an oviduct, or Fallopian tube and an ovary. In some cases, as associated hernial contents, we find omentum (121), a segment of the alimentary canal (56), a part of the urinary bladder (14), a rudimentary uterine horn (113) or the entire uterus, be the latter organ rudimentary (32) (127), infantile (98) or of normal development. The tube or ovary or both, in part or in their entirety, may be herniated. All the hernias appearing in our tables are external hernias, that is, their outermost overlying saccular covering is skin, and each, after reaching a certain stage of development, gives rise to a more or less visible, more or less palpable, external swelling in the inguinal, femoral, ventral, obturator, or ischiatic regions, depending upon the anatomical location of the hernia. Internal hernias, that is, hernias in which one or more loops of intestine find their way into pouches or recesses in the posterior peritoneal wall, and diaphragmatic hernias, be the latter true or false, congenital or acquired, constitute other chapters of surgery.

The escape of the uterine appendages from their normal situation may take place through any of the weak spots or openings of the lower abdominal or abdomino-pelvic cavities. A hernia originating either in the internal or in the external inguinal fossæ and escaping above Poupart's ligament, is an inguinal hernia; if, escaping beneath the same ligament, it emerges through the crural canal and the saphenous opening, it is a femoral hernia; if through the obturator canal, an obturator hernia; if along the course of the gluteal or sciatic nerves and vessels, emerging almost always above, very infrequently below the pyriformis muscle, very rarely through the lesser sacro-sciatic foramen, a gluteal hernia; if through an operative scar in the abdominal wall, a postoperative hernia.

These different anatomical varieties—gluteal, obturator, femoral, inguinal, etc.—differ in frequency of occurrence, in clinical manifestation, and in operative indications. Though each type demands a separate description, there are clinical conditions that may be present in any one of the different varieties: Reducibility, irreducibility, inflammation, torsion, and strangulation.

Though sanctioned by long usage, the classifying of hernias into congenital and acquired is, at times, misleading. It is misleading because it is practically impossible to determine the congenital or acquired nature of many hernias. Furthermore, the term congenital hernia, as now used, does not imply in the female, that the hernia was present at birth, as it is also applied to hernias whose

postnatal development is due to predisposing conditions of congenital origin: developmental defects, persistence of transitory, embryonal, or fœtal states which, owing to their non-disappearance with growth, permit the occurrence of outward visceral displacements. Some hernias are congenital in the truest sense of the word; they are complete at birth, hernial contents being then present. In most of the so-called congenital hernias, the sac only is existent at birth; in an acquired hernia, the sac is always of postnatal development, and in all but hernias par glissement is entirely derived from the parietal peritoneum. Congenital hernial sacs result from the want of closure of peritoneal processes, such as the processus vaginalis peritonei in the male, the canal of Nuck in the female, etc., normally present in the fœtus. Congenital hernias may appear at any period of life.

Orifices for the transmission of vessels and ducts are normally present in the muscular and aponeurotic layers of the abdominal walls. An acquired hernia is formed by the gradual or sudden escape through these orifices, pathologically widened, of viscera normally contained within the abdominal cavity; the viscera in their passage through and beyond the abdominal wall create paths of escape for themselves by bulging and pushing forward the parietal peritoneum.

By looking over the tables, it will be seen that in many cases the authors either did not state or were unable to determine whether the hernia at hand was of the congenital or acquired type. Even if an inguinal hernia first appear late in life, it is difficult in the female to state with absolute accuracy that an incompletely obliterated canal of Nuck did not predispose its occurrence.

The following tubal hernias are definitely stated to have been congenital: cases 1, 2, 8, 16, 21, 22; the following are reported to have been acquired: cases 1 (three cases), 3, 4, 5, 7, 10, 12, 13, 14, 15, 17, and 20. Among the congenital ovarian hernias may be mentioned cases 24, 28, 30, 32, 36, 39, 43, 52, and among the acquired ovarian, cases 26 (one case), 27, 28 (one case), 29 (two cases), 31, 37, 38, 45, 46 (one case), 47, 48, 49, 50, and 51. Cases 58, 62, 65, 66, 67 (three cases), 75, 76, 77, 79, 80, 81, 83, 84, 88, 89, 93, 96 (one case), 98, 99, 100 (one case), 102, 103, 105, 106, 107, 109, 110, 112, 113, 114, 115, 120, 122, 125, 132 were congenital tube-ovarian hernias, and cases 57 (two cases), 60, 64, 82, 92, 100 (one case), 116, 118, 123, 124, 128 (one case), 129, 134, and 135 were acquired tube-ovarian hernias. In many cases, the congenital or acquired nature of the hernia is either too vaguely stated or is left unmentioned. Femoral hernia seldom occurs before adult life.

Tubal, ovarian, and tube-ovarian hernias occur in the colored (89) and in the white race. Commonly, the condition is unilateral; infrequently, it is bilateral. When bilateral, the hernias may or may not be developed to the same degree on both sides. The bilaterality may date from birth; may be acquired. In the latter case, the hernias may from the first have been bilateral or an interval of time of shorter or greater length may have intervened between the appearance of the two hernias. In case 61, when patient was eight months old, the right inguinal hernia appeared, but the left inguinal hernia did not become manifest until the patient was four years of age. Bullitt's patient (65) first noticed his right-sided hernia six years ago; since that time a similar condition has developed on the other side. Case 21 presented on each side a congenital inguinal tubal hernia. Cases 24, 33, 41 (two cases) were bilateral inguinal ovarian hernias. The following inguinal hernias of both tube and ovary were bilateral: 61, 65, 77, 117, 136 (three cases). In case 127, there was removed from the right-sided hernial sac a mass which on examination was seen to consist of a tube, a small uterus without a cavity, and an ovary which had never functionated (patient was twenty-six years of age). The left hernial sac contained neither ovary nor tube but there was found in it a fibromuscular cord-like band resembling round ligament and a mass somewhat analogous to the uterus was found in the right hernial sac. All the bilateral tubal, ovarian, or tubo-ovarian hernias recorded in the medical literature of the last twenty years are of the inguinal variety. This is in accord with a well-known fact that, in both sexes, double femoral hernias are less frequent than double inguinal hernias.

A tubal, an ovarian, or a tubo-ovarian hernia may coexist with one or more hernias of other organs. Multiple hernias are not infrequent, the hernias present being either of the same or of different types, as two inguinal hernias (111) or one inguinal and one femoral hernia on the same or on opposite sides of the body. For instance, in case 9, there was a right crural intestinal hernia and a right obturator hernia of the Fallopian tube, coexisting with a left obturator hernia of the urinary bladder; case 19, a right tubal inguinal hernia, had been operated upon one year previously for a left-sided inguinal hernia; case 20, in addition to a right tubal femoral hernia, presented, on the opposite side of the body, a femoral hernia (epiplocele) of four years' standing; case 36 had two hernias, both congenital, a right-sided inguinal ovarian hernia and a small umbilical hernia; case 90, one of tubal gestation occurring in an irreducible left tubal hernia, also presented a right inguinal hernia containing omentum, transverse colon, and a loop of adherent intestine; in case 101, there was an obturator hernia of the ovary on the right side, and on the left side the crural canal contained a distinct small hernial sac; Schopf's patient (126), presented a left obturator tubo-ovarian hernia and bilateral reducible femoral hernias; in case 132, a right-sided inguinal tubo-ovarian hernia coexisted with a reducible left inguinal hernia. In none of our tabulated cases were more than three hernias present in the same individual.

The hernias which we have under consideration may or may not be associated with non-development, malformation, or absence of the other internal or of some external genitalia: infantile pelvic organs (55); bicornuate uterus (63); absence of vagina (32, 65, 77) imperforate vagina (98, 99); absence of vagina and cervix uteri (117). In Delay's case (77) rectal examination did not reveal the presence of a uterus; patient had never menstruated.

The hernia may coexist with other congenital pathological states, as patulous umbilical rings (84) congenital chronic hydrocephalus (22); may be present with acquired disease or acquired malposition of the uterus or of the non-herniated adnexa (complete uterine prolapse (18, 59,); uterine fibromyoma (14). In case 108, a hernia of the left tube and ovary, the uterus was displaced upward, forward, and to the left by a cyst of the right ovary having the volume of a man's head.

In almost all the cases the operation performed was a herniotomy, and as herniotomy affords little opportunity for direct examination of the pelvic organs, the condition of the non-herniated genitalia was determined in only a few cases.

Hernia is a widespread disease. The relative incidence of hernias of the uterine adnexa as to age corresponds to that of hernia in general. In our series the youngest patient (88) was four weeks old at time of operation. Nicoll (41) operated successfully for ovarian hernia two infants, each one and a half months old. The oldest patient (18) operated on was seventy-eight years old. She had a left tubal obturator hernia. Lickley (101) reports a right tubo-ovarian obturator hernia observed in a dissecting-room subject who had died of general debility and hemiplegia at the age of eighty-seven years. In many cases, the age is not stated. The age given in the tables corresponds to the age of the patient at the time of operation and not to the age at which the hernia first appeared. In the following cases it is mentioned:

2 to 3 months old: 21, 36, 41 (17 cases), 43, 66, 71, 86, 96, 115, 122–26 cases.
4 to 5 months old: 8, 28, 30, 41 (eleven cases), 81, 83, 91, 97, 106, 130, 131, 133–22 cases.
6 to 7 months old: 22, 41 (6 cases), 54, 76, 84, 103, 109, 114, 125, 132, 137—16 cases.
8 to 12 months old: 68, 80, 105, 112, 137—5 cases.
1 to 4 years of age: 39, 52, 61, 75, 102, 104, 107, 111 (2 cases), 119—10 cases.
5 to 10 years of age: 73, 136 (2 cases)—3 cases.
11 to 15 years of age: 79, 111—2 cases.
16 to 20 years of age: 2, 7, 19, 24, 28, 69, 93, 99—8 cases.
21 to 25 years of age: 1, 16, 25, 32, 70, 82, 94, 117, 128, 129—10 cases.
26 to 30 years of age: 7, 26, 77, 89, 98, 127, 128, 134—8 cases.
31 to 35 years of age: 1, 5, 6, 27, 31, 45, 46, 50, 55, 58, 62, 64, 95, 96, 100—15 cases.
36 to 40 years of age: 4, 12, 13, 14, 20, 23, 26, 29 (2 cases), 33, 38, 51, 56, 57, 61, 63, 70, 72, 90, 92, 100, 113, 118—23 cases.

41 to 45 years of age: 1, 11, 42, 57, 60, 120, 124, 135—8 cases.
46 to 50 years of age: 3, 15, 17, 47, 49—5 cases.
51 to 55 years of age: 87—1 case.
56 to 60 years of age: 1, 34, 59—3 cases.
61 to 65 years of age: 7, 10—2 cases.
66 to 70 years of age: 48, 123, 126—3 cases.
71 to 75 years of age: 37, 116—2 cases.

The above table demonstrates the following:

a. The frequency of hernias during the first year of life—69 cases.

b. The rarity of the condition from the second to the fifteenth year of life inclusive—15 cases.

c. The noticeable progressive increase in the number of hernias observed from the fifteenth year on, the maximal frequency being seen during the fourth decade of life. Sixty-four cases occurred during the period included between the fifteenth and fortieth year.

d. After the fortieth year there is a decline of the number of hernias; they become relatively rare as the extremes of life are approached.

The preponderating frequency of hernias in the first year of life is due to the large number of congenital hernias and also to the fact that during the first year more persons are alive than during any subsequent year. By the closure of the abdominal rings, by the obliteration, partial or complete, of the processus vaginalis peritonei or of the canal of Nuck, and by the building up of the posterior wall of the inguinal canal, many congenital reducible hernias are cured spontaneously during the first two years of life. Thus is explained the great dropping off in the number of hernias observed between the second and the fifteenth year. With the advent of adult life, many of the predisposing and exciting causes of acquired hernias become operative and ruptures during this epoch are noticeably frequent. As hernias, by their complications, shorten life-duration, the number of hernia-bearing individuals that reach an advanced age is small as compared to that of the non-herniated.

During the child-bearing period hernias of either or of both uterine appendages have been observed in nulliparæ (70, 102, 117, 127); in primiparæ (1, 10, 16, 82), and in multiparæ (1, 29, 47, 58, 70, 72). Other cases in which pregnancy occurred either previous or during the existence of tubal, ovarian, or tubo-ovarian hernias are the following 2-para (7, 33, 46, 70, 90, 118). Cases 29, 89, 116, 129 were 3-para; 92 and 126 were 4-para; 27 and 35 were 5-para; 38, 56, 60 were 6-para; 12 and 31 were 8-para; case 135 was a 9-para, and case 124 was a 13-para.

Reference to the tables shows that some of these hernias appeared soon after childbirth (29, 82, 128), that some were congenital (58), though most were acquired, some gluteal (72), obturator (126), inguinal or femoral (42). In case 118, a 2-para, one miscarriage in case 31, an 8-para, three abortions are noted; in case 29 several miscarriages are recorded.

ETIOLOGY

The predisposing and exciting causes of tubal, ovarian, and tubo-ovarian hernias are shown by the analysis of the collected cases to be the same as those of other hernias in the female. The persistence of the canal of Nuck is an etiological factor of the greatest significance in the causation of inguinal hernias. The canal of Nuck, the homologue of the processus vaginalis peritonei in the male, is a peritoneal diverticulum accompanying and adhering intimately to the round ligament, descending in some cases as far as the insertion of that ligament in the labium majus. This peritoneal process, whose dates of origin and disappearance are not accurately known, is usually found completely obliterated at birth, it may close after birth; it may even persist throughout life.

Camper found the canal open in the newborn in 21.4 per cent. Sachs found the canal open in infants (0-335 days) in 16 per cent. Féré found the canal open in infants (1–365 days) in 15.5 per cent; from one day to 13 years in 10.9 per cent. Wrisberg, in bodies of various ages, 9.5 per cent. Macready (7). Cruveilhier, Zuckerkandl, Richelot, Berger, and others have commented upon the importance of the persisting canal of Nuck as an etiological factor.

When the canal of Nuck is only partially or completely unobliterated, it forms a potential hernial sac, and the non-closure of Nuck's

canal is conceded to be the most important congenital predisposing cause to inguinal hernia formation. It is a matter of common knowledge that preformed sacs are not of infrequent occurrence in the inguinal region. They have rarely been found in other hernial regions. A sudden or forcible increase in intra-abdominal pressure, such as can be determined by muscular effort, by a misstep in an attempt to save one's self from falling, can lead to hernia formation by causing the irruption in a preformed sac of a tube, an ovary, or a tube and ovary. As during infancy the internal genitalia can neither be displaced by their physiological activity which is nil nor by the development of pelvic tumors (rare during early childhood), nor by muscular effort, it follows that hernias of the uterine appendages, at that period of life, are due to such congenital anatomical defects as facilitate tubal, ovarian, or tubo-ovarian displacement.

Though, as an etiological factor in the production of hernias, the existence of hereditary predisposition is denied by some authors, to us, the influence of heredity appears positive. Hernia being a malformation often due to developmental arrest, such as non- or incomplete obliteration of the processus vaginalis peritonei, non-obliteration of umbilical ring, etc., it is subject to hereditary transmission. Berger says that the analogy of structure known to exist between ascendants and descendants manifests itself in various ways: facial featural resemblance, like pelvic capacity and obliquity; like ligamentous and aponeurotic resistance; like width and narrowness of orifices through which hernias may escape, analogous muscular development of abdominal wall, etc. It is reasonable to assume that like structural characteristics beget a like predisposition and a like resistance to hernia development.

In three hundred and sixteen herniated individuals, Malgaigne found hernias present eighty-seven times in other members of the same family. Berger endeavored to determine the influence of heredity by analyzing seven thousand, five hundred and forty-two cases. He found the influence of heredity marked in two thousand and seventy-nine of these hernias. Manley reports a case (107) of irreducible congenital inguinal hernia of the right tube and ovary. The father of this patient had a large irreducible inguinal epiplocele. Mencière's case (111) was a reducible inguinal hernia of the left tube and ovary occurring in a patient whose mother and grandmother were each afflicted with a left inguinal hernia; 79b and 112 are other cases in which heredity apparently was an etiological factor. In the latter (112), a congenital tubo-ovarian hernia, the patient's brother had died of strangulated inguinal hernia; in the former 79b, an irreducible left inguinal tubo-ovarian hernia, the patient's grandfather and father both had hernias. Among other etiological factors should be mentioned:

1. All conditions associated with increased mobility of the uterine appendages:

a. Lengthening of the broad ligaments consecutive to repeated pregnancies. Owing to its loose attachment to the broad ligament, the position of the ovary is easily affected by the physiological or pathological movements and displacements of the pelvic orgsns.

b. Pathological relaxation of the ligaments due to puerperal subinvolution. As a cause of the various uterine displacements, pregnancy is an important factor.

c. Abnormal length of the broad, ovarian, and infundibulo-pelvic ligaments. Lockwood and others look upon abnormal length of the mesentery of the herniated organ as the chief cause of ovarian hernias. The opinion that lengthening and undue elasticity of the infundibulo-pelvic and ovarian ligaments are responsible for many hernias of the uterine appendages, has been expressed by a number of observers.

d. Relaxation of the other tubal, ovarian, and uterine ligaments. Pelvic tumors, uterine fibroids, and other pathological states associated with marked increase in the volume of the uterus, not infrequently determine a relaxation of the infundibulo-pelvic ligament.

2. All conditions that tend to increase the intra-abdominal pressure.

a. Sudden increase of the intra-abdominal pressure leads to hernia formation by overcoming the resistance offered by one or another of the weak points of the abdominal

wall. Sudden increase of the intra-abdominal pressure may lead to the irruption of a tube, ovary, or tube and ovary in the sac of an old enterocele. Thus, case 45, an inguinal ovarian hernia, appeared after a fall; in Broca's case of bilateral tubo-ovarian inguinal hernias, the hernia on the left side appeared after a coughing-spell (61).

b. Occupations necessitating repeated muscular efforts associated with increased intra-abdominal tension, as the lifting or pushing of heavy weights, etc. Case 1, an irreducible femoral hernia of the left tube; case 25, an irreducible inguinal hernia of left ovary; case 60, an irreducible hernia of the left tube and ovary; case 38, an acquired crural ovarian hernia, and case 129, an acquired inguinal tubo-ovarian hernia, all followed heavy lifting. In case 134, after severe exercise, there appeared an inguinal hernia of the left tube and ovary. In Kousmine's case (13) an acquired femoral hernia of the left tube, the patient's lower abdomen had been forcibly and repeatedly compressed by massage movements applied from above downward and from the costal arches toward the median line of the body. The hernia appeared two days after the patient's subjection to this treatment.

c. Physiological or pathological states which distend the abdominal cavity, which stretch the abdominal parietes, and widen the orifices normally present in the muscular and aponeurotic layers of the abdominal wall. Enteroptosis, obesity, abdominal tumors, ascites, pregnancy, etc., can be regarded as predisposing and exciting causes to hernia production. In Gladstone's case (9), there was present increased intra-abdominal pressure consecutive to rectal obstruction caused by a thickened middle valve of Houston. Pregnancy is by far the most important of all the conditions that increase intra-abdominal tension. Hernias are of far more frequent occurrence in women who have borne children than in those who have remained sterile. Out of 978 women afflicted with inguinal hernia, 772 were mothers, and more than six hundred of these were either 2-para or multiparæ. Gestation acts in various ways: As it progresses, the position of the internal genitalia is changed and uterus, tube, and ovaries ascend above the pelvic strait. Pregnancy increases the mobility of the uterine appendages, distends, weakens, and attenuates the abdominal parietes; it stretches, widens, and dilates the hernial orifices, and abnormally lengthens the broad ligament. Gestation further predisposes to hernia formation by loosening the subperitoneal connective tissue, relaxing the mesenteric and other means of visceral fixation, and altering the intra-abdominal capacity. The expulsive efforts of delivery also exert an undeniable etiological influence in hernia formation. Some of the hernias appearing in our tables were first noticed after childbirth (29, 82, 128). After delivery, pre-existing hernias often show an increase in volume. Souligoux' case (129), an acquired tubo-ovarian hernia, showed after each pregnancy an increase in size.

3. All conditions which weaken the abdominal wall. "By congenital defect, laxity of tissue, or by long-continued pressure, the peritoneal covering over one or another ring becomes pouched and a lodgment of abdominal contents serves as a wedge to clear the hernial canal" (Marcy). A hernia can occur wherever the parietal peritoneum is not sufficiently supported by the transversalis fascia and the other structures of the abdominal wall.

a. Acute or chronic diseases debilitating the organism, especially such as cause great emaciation. Emaciation weakens the resistance of the fibrous layers, dilates the orifices in the abdominal aponeuroses, rarifies the pelvic connective tissue, facilitates the gliding of the parietal peritoneum upon the underlying tissue and thus favors the formation of a hernial sac (132).

b. Obesity weakens the abdominal wall and increases the intra-abdominal pressure. The fat present in the abdominal wall, in the omental, mesenteric, and other peritoneal folds explains why obesity plays such a rôle in hernia development. Properitoneal lipomata by exerting traction on the peritoneum and by insinuating themselves through gaps in the abdominal wall can lead to the formation of peritoneal diverticula. These diver-

ticula, once constituted, are potential hernial sacs. Not infrequently the bulk of the hernial swelling is made up of a lipoma behind which the peritoneum is drawn outward in a funnel-shaped manner.

c. Traumatism (13). Most often the traumatism does not cause the hernia, but only reveals its existence. Among traumatisms must be mentioned abdominal operations and their sequelæ. Pathologic adhesions of viscera or omentum to the anterior parietal peritoneal wall near a hernial opening may act as a predisposing cause.

d. Enteroceles, epiploceles, and entero-epiploceles. Garrigues is of the opinion that the herniated uterine adnexa had glided in one of Broca's cases and also in Poirier's case, into enterocele sacs.

e. Feeble development or atrophy of the aponeurosis of the transversalis muscle, and of the conjoined tendon. This factor is an important one in direct inguinal hernia.

f. A shortening of the round ligament of the hernial side is not rare. Authors are not agreed as to whether this shortening is primary or secondary.

HERNIAL SACS

Congenital hernias have sacs of prenatal formation. That the canal of Nuck remains patent in many cases long after birth, even into adult life, has been proven by a number of investigators. Acquired hernial sacs are formed of parietal peritoneum forced by intra-abdominal pressure through some congenital or acquired defect in the abdominal walls.

In the female, the following anatomical characteristics are strongly suggestive of the congenital sac: Great vascularity, absence of subserous fat, folds, valvular or diaphragmatic constrictions, cyst-formations, scar-like induration of the wall, etc. In congenital inguinal hernias, it is also noted that the round ligament is intimately adherent to the sac. This intimate adherence of the round ligament to the sac has also been observed in some acquired hernias, as in case 29b, in which "round ligament was thoroughly adherent to sac." In case 96, a congenital hernia, the sac was accompanied posteriorly and internally by the fibers of the round ligament.

As we see, the sac results from the bulging outward, without solution of continuity, of the parietal peritoneum. It consists of a neck, body, and fundus. The neck is the portion of the sac situated within the hernial orifice; the body, the main portion of the protrusion, and the fundus, the lowest part of the sac. Of these three, the neck is the most important. It is through it that the general peritoneal cavity communicates with the hernial sac cavity. It may be the site of constriction. In case 6, the neck gave to the finger the sensation of a sharp-cutting band. The fibrous envelope of the sac is due to the condensation of the fibrous layers which the hernia in developing pushes forward.

The internal surface of the sac, whether the latter be congenital or acquired, has all the peculiarities of serous membranes. When exposed to irritation, pressure, circulatory disturbances, or when inflamed it shows a tendency to secrete an excess of serum, to form exudates, and to undergo degenerative structural changes. Irreducible hernias are most frequently due to an adhesive inflammation involving either the sac or the sac and its contents. The opposing saccular surfaces may adhere and may, through the organization of inflammatory deposits, become united. Inflammation of a hernial sac may lead to any of the following conditions: formation of inflammatory bands within the sac cavity, hydrocele of a hernial sac, partial or complete obliteration of the sac, irreducibility of hernial contents previously reducible, etc.

In the female, encysted inguinal hernias result from partial closure of the canal of Nuck, the peripheral portion of which is transformed into a cyst in which a developing hernia prolapses, or from the sinking of a hernia in a pre-existing hernial hydrocele.

There is really no sacless hernia; but the herniated viscus may be an organ only partially covered with peritoneum—for example, the cecum in about 7 per cent of individuals is covered with peritoneum only on its anterior and lateral surfaces while posteriorly it is loosely attached by connective tissue to the posterior abdominal wall.

In sliding hernias, the anterior and lateral portions of the sac are, as in ordinary hernias,

derived from the parietal peritoneum, while the remaining portion is formed by the anterior surface of the herniated cecum, sigmoid, bladder, or Fallopian tube. In case 7c, the sac was formed by the two layers of the broad ligament. When a hernia follows a traumatism or an operation, the sac may be incomplete for a considerable distance. In case 74, a postoperative hernia, the herniated ovary, covered everywhere with adhesions, was directly beneath the skin. After an operation for radical cure of a hernia, should the peritoneum tear along its line of suture and a fresh hernia develop, the herniated viscus or viscera will not have a peritoneal sac covering. In case 59, the herniated organs were extrasaccular. The hernia had been operated ten years previously, but had recurred six months later, following paroxysms of cough.

Hernial sacs may be dome-shaped, cylindrical, digitiform, sacculated, or irregular; may show constrictions with intervening dilated portions. In case 20, sac was irregularly pouched and distended with fluid. Sacs vary in size. Some are small, some are large. They enlarge at the expense of the parietal peritoneum, that membrane being capable of very great gradual extension. Most femoral sacs are small and not infrequently are embedded in a mass of fat. The sac in recent hernias may be very thin. In children and in young infants, sac is extremely thin. Under the influence of irritation or inflammation, it undergoes thickening (36, 17, 45). Sac and coverings much thickened owing to chronic inflammatory changes. Sac may be inflamed (10); may lie embedded in a mass of fat, as in Gladstone's case (9) of obturator hernia, in which sac lay embedded in a mass of fat beneath the obturator externus muscle. In case 4, sac was lipomatous. In case 62, sac did not communicate with peritoneal cavity.

HERNIAL FLUID

As can be seen by perusing the tables, the reporters not infrequently state that fluid of some nature or other was present in the hernial sac. The fluid may be muco-purulent (16), serous, sanious, purulent, or fetid in character (123). Thus, in cases 35 and 90, fluid and clotted blood was present in the hernial sac. Case 90 was a case of ruptured ectopic pregnancy occurring in a left inguinal tubal hernia. The sac contained in addition to the herniated organs a ruptured ovum and an eleven to twelve weeks old fœtus. In case 70, there were removed from a right inguinal hernial sac a tube, a remnant of an ovary, and six pounds of white liquid. In case 78, the sac contained the right uterine adnexa and two hundred grams of yellowish fluid. The sac in case 20 contained two ounces of clear serum and a fibrinous clot. In case 56, the hernial sac contained offensive pus due to a ruptured appendix. In case 89, the yellow odorless pus present in the hernial sac came from a strangulated and partly necrosed uterus; during the operative manipulations, this organ was torn and pus contained in its cavity escaped. Hæmorrhagic or dark-colored fluid was found in the sacs of some strangulated hernias (92, 97, 126) and in some of those complicated by torsion of the hernial pedicle (54, 66, 75, 84, 103, 109, 112, 115, 122, 125). The herniated organs in these cases always show more or less marked circulatory disturbances. In cases 1, 63, 88, 129, 135, the hernial sac contained light, yellow-colored serum. The presence of hernial fluid is also noted in cases 4, 10, 11, 18, 20, 26, 69, 76, 96. When ascites develops in a herniated individual, the distension of the hernial sac by the peritoneal serous fluid is frequently one of the symptoms of which the patient most bitterly complains.

HERNIAL SAC-CONTENTS—TUBAL HERNIAS

The tube, either in part or in its entirety, may be the sole content of the hernial sac. In case 9, only the middle portion of tube was in the hernial sac; in case 13, only the external half. Case 14 contained a Fallopian tube and a portion of the urinary bladder. In case 15, there was present a tube and the appendix vermiformis; in this case, the tube had slipped into the sac only by its middle portion, which was bent into a loop, so that the free end remaining in the abdomen was the only part strangulated. In case 19, the herniated portion of the tube was its middle portion; both uterine and abdominal ends were in the abdominal cavity. In case 5, the hernial sac

contained a solid cord. This on examination proved to be the Fallopian tube.

As associated hernial contents, a portion of the urinary bladder (14), normal intestine (18), gangrenous intestine (11, 23), and omentum (1b, 7, 16, 17, and 18) were noted.

The herniated tube may be normal and free (2, 7a); may be adherent to sac (19); may be strangulated (3, 4, 8, 11, 12, 14); may show inflammatory lesions (7c, 17); may be cystic (15, 79b); may be the seat of a pyosalpinx (10). In Lejars' case (14), the tube was congested and its lumen dilated; on pressure, muco-purulent fluid could be made to escape from the pavilion. In case 16, patient had an acute vaginitis; infection had extended upward along the genital tract into the hernial sac, and the latter contained a muco-purulent fluid. Saccular peritonitis secondary to tubal infection is not infrequently noted.

OVARIAN HERNIAS

The ovary may be the only content of the hernial sac, or be associated with a cystic parovarium (24, 27), with omentum (33, 34), with intestine (29, 39, 46), or with a rudimentary uterus (32). The herniated ovary is reported as having been normal (25), enlarged to twice its normal size (26), infiltrated with blood (30), the seat of a large hæmatoma (28), adherent to sac (29, 37, 43, 44), cystic (26, 27, 40, 50), and to have presented areas of suppuration (48). In case 36, 38, and 43, it showed gangrenous changes. The herniated cystic ovary, in case 33, had the volume of a man's head and showed the typical structure of a reticular cyst of the ovary. In case 42, the herniated ovary was a multilocular ovarian cyst containing a thin odorless fluid; it measured 6x4 cm. The hernial contents in case 47 was a spindle-cell sarcoma of the ovary. In case 51, the removed mass showed the elements of a fibromyoma of the ovary.

TUBE-OVARIAN HERNIAS

Hernias of the tube and ovary constitute the largest number of hernias of the uterine appendages. As associated hernial contents may be mentioned: Urinary bladder (67), Meckel's diverticulum (56), the appendix vermiformis (56, 87, 95), omentum (92, 121, 129), intestine (56, 59, 64, 79, 87, 90, 92, 116, 123, 124, 126, 127, 129), the uterus (63, 67, 74a, 77, 93, 99, 116, 124, 137. In case 64, a pouch of peritoneum adherent to the hernial sac contained a bladder diverticulum. Some of these hernias had varied contents. In case 58, sac contained both tubes and ovaries and the uterus. In case 98, there was found in the hernial sac an infantile uterus, two tubes, and one ovary. In case 99, the sac contained one ovary, the tubes and the uterus. In case 100, the hernial contents proved to be the uterus and the right and the left suppurating adnexæ. Case 76 was a hernia of the entire utero-ovarian apparatus. Case 89, one of the right ovary and tube, uterus, and left tube. In case 78, there was found one ovary, one tube, and about 200 cc. of yellowish fluid. In case 87, the hernial contents consisted of a distended and congested cecum, a normal eight centimeters long appendix, the right tube and ovary, and the uterus. Case 95 is interesting in being a left-sided oblique tubo-ovarian inguinal hernia, in the sac of which was found also the appendix vermiformis.

We know of only two cases in which gestation occurred in an inguinal hernial sac; both were tubal pregnancies. In one case (90), the ovum laid among loops of gut at the bottom of the hernial sac. The other case was operated on by Dr. Carl Beck of this city. He has forwarded the following notes concerning it:

"Several years ago I was called into consultation with a doctor to see a woman living on Lincoln Ave., age about 43 years. Patient had been suffering for some time from an inguinal growth about the size of a fist. The growth had increased gradually to this size and more recently it had become very painful. During the past forty-eight hours, pain had been so severe that morphine injections had to be given. Patient had vomited and suddenly during one of these vomiting spells, the tumor had increased considerably in size. When I saw patient, she was in a collapse and showed symptoms of internal bleeding. Patient was transported to the hospital and the tumor opened, whereupon it was found to be a pregnant tube which had ruptured, the fœtus being about the size of two to two

and one-half months. The uterus was enlarged and soft. The tube and ovary were removed, patient making an uneventful recovery."

The reader is referred to the tables for additional information in regard to sac-contents of tubo-ovarian hernias.

The herniated organs may be normal (21, 111a), may show slight or marked pathological changes. The displacement of a tube or of an ovary into a hernial sac is unfavorable to its anatomical and functional integrity. In a hernial sac, these organs are exposed to repeated slight traumatisms and to circulatory disturbances. The herniated ovary frequently undergoes cystic changes [59, 60, 66, 67, (3 cases), 72, 74, 77, 79, 113, 118, 120, 128, 130]; may show atrophy (64, 94, 134); may show enlargement (67) (80, ovary enlarged sixfold) (82); may be undersized (65).

In the following tubo-ovarian hernias, the herniated tube was the seat of suppurative salpingitis (100b), of abscess (60), of tuberculosis (119). In case 85, the sac contained the uterus, the ovaries, and two pus-tubes. In case 82, the tube was sausage-shaped and contained three abscesses separated from each other; the accompanying ovary was enlarged. Tube may be adherent to sac by an inflammatory band, as in case 57b. In case 128, the mucosa of tube was thickened and covered by a muco-purulent deposit. Usually, both tube and ovary show analogous changes; thus they may be congested (128), cyanotic (88), in a state of beginning gangrene (81, 83, and 97). In case 121, the sac contents, tube, ovary, and omentum were the seat of suppuration. In this case it is probable that the epiploitis was primary and the tubo-ovarian infection secondary. The sac, ovary, and tube in case 111b were the seat of tuberculous granulations. In case 55, the ovary was imperfect, the uterus rudimentary, and the Fallopian tube showed no fimbriated extremity. In case 123, the herniated intestine, tube, and ovary were in a state of beginning gangrene. We must not forget to state that a tube and ovary present in a hernial sac do not always have the same reciprocal relation that they have in the abdominal cavity, and that the pathological changes which they show may antedate their displacement into a hernial sac.

REDUCIBLE HERNIAS

In reducible hernias, and, at first, practically all hernias are reducible, the hernial contents either return spontaneously into the abdominal cavity when the patient assumes the recumbent posture or they can be manipulated back, with more or less difficulty, but without a cutting-operation, into the cavity from which they escaped. Even in reducible hernias, the sac early contracts adhesions to neighboring tissues and becomes irreducible. The terms reducibility, irreducibility, torsion and strangulation have reference only to the hernial contents, and not to the sac.

Reposition, spontaneous or manual, may be temporary, may be permanent. Many reducible hernias reappear, as soon, as the standing posture is assumed; others, to reprotrude, require more or less muscular effort on the part of the patient.

Among the reducible inguinal hernias may be mentioned Zinnis' case of congenital ovarian hernia (52), Le Nouëne's (100) case of acquired tubo-ovarian hernia, and Bloodgood's two cases (57) of incomplete hernia of the tube and ovary. Case 26b was an ovarian inguinal hernia, reducible under narcosis.

IRREDUCIBLE HERNIAS

When the contents of a hernial sac cannot in their entirety be manipulated back into the abdominal cavity, the hernia is said to be irreducible, provided that there is not any, or but a very slight, interference with the blood supply of the herniated organ or organs, and that there is no disturbance of function. If irreducibility and both functional and circulatory disturbances are present, the hernia is designated as strangulated. Irreducibility, partial or complete, predisposes to complications of a serious nature: inflammation, incarceration, strangulation, and torsion. The herniated organ or organs may be movable and nevertheless irreducible.

The irreducibility of hernias is dependent upon one or more of the following factors:

a. Difficulties incident to manipulating a small movable body such as the ovary through a small opening.

b Relative narrowness of the hernial canal: femoral, inguinal, etc. In case 132, reposition was prevented by a narrow hernial ring.

c. Sudden increase in size of hernia, resulting from some unusual muscular effort.

d. Changes in the hernial contents: Increase in bulk from deposit of fat; from cyst formation in mesentery, in omentum; from inflammatory or neoplastic changes.

e. Adhesions of inflammatory origin:

1. Between sac and contents (1, 5, 7, 19, 25, 37, 44, 46, 73, 95, and 107). In case 90, the colon was adherent to hernial sac; in case 46, the intestine; in case 120, the ovary; in cases 94, 96, and 128, the tube.

2. Between the different contents (34); ovary intimately adherent to tube (119).

Among the causes of inflammatory adhesions may be mentioned: Inflammation during intra-uterine life; traumatisms; strangulation that has not been severe enough to determine gangrene; long-continued pressure due to wearing an ill-fitting truss; inflammation of sac, of hernial contents, or of both. At times, the adhesions form without producing symptoms. Adhesions not only cause irreducibility, but also predispose to strangulation, and in the hernias under consideration, to the accident known as torsion.

f. Large volume of the hernia. In case 33, the herniated cystic ovary had the size of a man's head. In case 124, the hernial sac contained ovary, tube, uterus and some intestinal loops. The hernial ring easily admitted operator's fist.

g. Sliding hernias (*hernies par glissement*). In hernias of this nature, part of the contents is a viscus not entirely surrounded by peritoneum and therefore not freely movable, but partially fixed. The urinary bladder, the Fallopian tube, the cecum, and the sigmoid colon are the most common contents of sliding hernias. In these hernias, the protruded viscus or viscera bear the same relation to the hernial sac that they bore to the general peritoneal cavity when normally placed or previous to their displacement. Another characteristic of sliding hernias is that the peritoneal covering of one of the herniated viscera or of the herniated viscus enters into the formation of the hernial sac.

The irreducibility of a hernia of the uterine appendages is due in some cases to the presence as associated hernial contents of the urinary bladder, of the cecum, or of the sigmoid. In other cases, the irreducibility is due to the fact that the layers of the broad ligament, as they leave the Fallopian tube, enter into the formation of the hernial sac. Case 22 was a sliding inguinal hernia of the left tube; "the tube was adherent by a meso to the posterior portion of the hernial sac." In case 38, a femoral hernia of the right ovary, the hernial sac proved to be the broad ligament. In case 83, a tubo-ovarian inguinal hernia, the anterior layer of the broad ligament contributed to the formation of the anterior wall of the hernial sac.

STRANGULATED HERNIAS

All strangulated hernias are irreducible. In addition to irreducibility, they present a constriction of the hernial contents of such a degree as to seriously interfere with the circulation of the blood in the herniated organ or organs. "If the pedicle of a tumor is tied off or if a finger is surrounded tightly by a string, the parts distal to the ligature do not become inflamed; stasis and gangrene result." (Alberts.) The same primary changes occur in the contents of a strangulated hernia; the inflammatory changes are secondary to the circulatory disturbances. There is interference first with the venous circulation; then, with the arterial circulation. As a result of this interference with the circulation, we have a serous exudate the amount of which depends upon the degree and duration of the strangulation and also upon the extent of the secreting surface. The sequence of events is, as follows: Congestion (91, 116), stasis (68, 86, 106), serous exudation, then inflammatory phenomena and gangrene (97). Strangulation of a herniated tube or ovary is not as dangerous a complication as strangulation of a herniated loop of intestine. We have discussed under their respective heads strangulated ischiatic, obturator, and femoral hernias. Among the strangulated inguinal hernias may be mentioned case 14, in which the hernial sac contained, in addition to the Fallopian tube, a part of the

urinary bladder. The hernial ring in this case constricted the tube, which was markedly congested therefrom. Lejars removed the diseased portion of the tube. In the course of the operation, the bladder had been torn and sutured; a urinary fistula resulted. It gradually healed. Patient recovered but the hernia recurred. Case 59 was a nun with a left mandarine-sized inguinal hernia extending into the labium majus. Patient had been operated upon for hernia ten years previously, but following a coughing spell, the hernia recurred. Upon incision, it was seen that the herniated tube and ovary were extrasaccular. Uterine prolapse coexisted.

Some of these strangulated inguinal hernias were congenital (8, 30, 36, 68, 86, 91, 97, 106); six were acquired (14, 29, 59, 74a, 92, 116). Strangulation can occur at any age, irrespective of type of hernia or of hernial contents. Gaudier's (8) patient was four months old; (Ogé's (116) patient was seventy-one years of age.

As hernial contents can be mentioned the following organs: Fallopian tube (8), ovary (30, 36), tube and ovary (59, 68, 86, 91, 97, 106), tube and a portion of the urinary bladder (14), tube and a loop of small intestine (23), ovary and about twenty inches of intestine (29), tube, ovary, intestine and omentum (92), uterus and adnexa of one side (74a, 89), loop of intestine, uterus, and left adnexa (116).

The following anatomical changes incident or rather consecutive to strangulation were noted in the herniated organs. We quote the words of the reporters. In case 23 "sac contained swollen congested Fallopian tube and a gangrenous and ruptured loop of small intestine." In case 29, the sac "contained the ovary and about twenty inches of dark purplish and almost gangrenous intestine." In case 30, "microscopical examination showed ovary everywhere infiltrated with blood." In case 36, "the thickened sac contained discolored ovary almost black." In case 91 "ovary and part of Fallopian tube were engorged with blood and swollen to about the size of an adult organ." In case 92, "the small bowel had been caught and was held firmly by the external abdominal ring." Strangulation at times is due to constricting bands present either in the sac itself or in the immediately surrounding tissues. Though, usually, there is but one constricting point there may be several constricting points in one and in the same hernia. In cases 8 and 86, the hernial ring was the constricting agent. "Strangulation in twenty-four strangulated hernias was due in twenty-three cases to a tight external ring."

The symptoms given by these strangulated inguinal hernias were those of inflamed hernias. In only five of these cases (23, 29, 30, 92, 116) were symptoms of intestinal obstruction present, and in four of these the sac contained strangulated intestine. Churchill's case (30) of strangulated ovarian hernia was the only one in which, in the absence of strangulated intestine, symptoms of ileus were present.

All these strangulated hernias were operated; all but one (23) recovered. This fatal case was operated upon while patient was *in extremis*.

The following operations were performed: In case 92, the hernial contents were returned into abdominal cavity. In case 8, the tube was removed. In cases 29 and 30, the herniated ovary was ablated. In case 74a the hernial contents were removed and in the remaining cases a salpingo-oöphorectomy was performed.

TORSION OF THE PEDICLE

This complication, peculiar to ovarian [28, 39, 40 (two cases), 43] and to tubo-ovarian hernias (54, 66, 67, 75, 80, 81, 83, 88, 102, 103, 105, 109, 112, 114, 115, 122, 125, 132) is not of unusual occurrence. As far as we have been able to determine, torsion of the pedicle has been observed only in irreducible congenital hernias of the inguinal type. In one case, however, in which this accident occurred the hernia was partly reducible (28).

The two youngest patients were four (88) and eleven (115) weeks old respectively; the oldest, a poorly nourished child, was fourteen months old (75). All the other patients were less than one year old. The right and left side are involved with about the same frequency. Our tables show that torsion of the pedicle

occurred in eight left-sided and in eleven right-sided hernias. In seven cases (40, 67, 114), the reporters fail to mention which side was affected. The occurrence of this accident is favored by the mobility of the ovary and the slenderness of the pedicle of the herniated organ or organs, at this period of life.

The pedicle, usually composed of the Fallopian tube, broad ligament and contained vessels (112, 115), may have made a half-turn upon itself (66, 102, 103); may be twisted twice (28), thrice (81, 83), or several times upon its axis (105). In case 115, it is stated that the pedicle, formed by the broad ligament, containing the Fallopian tube and the ovarian vessels, was twice twisted in the direction opposite to that of a screw. In case 112, the slender pedicle had turned upon itself to the extent of two and a half times. The pedicle may be twisted in any part of its course, "just behind the external abdominal ring" (125), twist at internal abdominal ring (122).

If unrelieved, torsion of the pedicle determines in the hernial contents anatomical changes similar to those caused by strangulation. The impeded return of blood in the veins leads to congestion and swelling of the organ or organs below the twist. This passive congestion, due to compression of the vessels by the torsion of the pedicle in which they are contained, causes serous and hæmorrhagic transudations both in the herniated organ and in the hernial sac. Belbin (54) states: "The fimbriated end of the Fallopian tube and the ovary were both black and swollen. There was no tightness or constriction of the pedicle at the internal ring. The congestion was due to the double kinking of the pedicle." In case 103, it is stated that the canal was roomy and seemed incapable of constricting its contents. The reporter adds: "The half-turn of the pedicle was the cause of the vascular engorgement of the tube, ovary, and broad ligament." Thus are noticed in the hernial contents the following circulatory disturbances: Congestion (39, 115), stasis (122), thrombosis, vascular rupture (ovary seat of large hæmatoma) (28), and interstitial hæmorrhages (105). The interstitial hæmorrhages and the serous transudates lead to tissue dissociation. In case 88, the ovarian stroma was infiltrated with red and white blood corpuscles. Gangrene of greater or less extent frequently results. In cases 81 and 83, the herniated organs were in a state of beginning gangrene; in cases 43, 75, 80 and 125, the hernial contents showed gangrenous foci. In some cases, the mesosalpinx between the tube and ovary was swollen, diffusely injected and covered with fibrin flakes. It is difficult to state with precision the time required for these changes to occur. That in these cases the circulatory disturbances are due to torsion and not to constriction of the pedicle is evidenced by the following statements appearing in the reports: "Strangulation was the result of twisting of broad ligament and not of constriction by the neck of the sac or by the abdominal wall" (67); the ovary was not strangulated, the slender pedicle lying quite loose in the neck of the sac" (115); "No compression of pedicle in hernial canal" (125); "Canal was roomy and seemed incapable of constricting its contents" (103).

In torsion of the pedicle, the amount, odor, and color of the hernial fluid depend upon the tightness and duration of the twist and upon the extent of the gangrenous changes. The fluid present in the hernial sac may be serous (88, 105), may be blood-stained (109, 112, 115, 125). In case 66, the hernial fluid was dark colored; in case 75, reddish-brown; in case 122, dark fluid blood was present in the hernial sac.

Torsion of the pedicle gives rise to symptoms somewhat analogous to those of strangulated intestinal or omental hernias. In fact, the condition has frequently been diagnosed as a strangulated intestinal hernia. In case 28, it is stated that the swelling presented all the symptoms of a strangulated hernia minus the digestive disturbances and minus the general state of collapse. Pain is the most frequently noted subjective symptom. In many cases, the patients vomited (43, 81, 88, 105, 109, 115, 132). In these cases, the absence of absolute constipation helps to exclude ileus. The diagnosis, therefore, is based upon the presence of a painful hernial swelling, associated with an incomplete symptomatic picture of strangulated hernia. In case 39, after

enlarging the hernial ring, the herniated ovary and intestine were returned to the abdominal cavity. The herniated ovary was removed in case 28, 40, and 43. In all the other cases, the herniated tube and ovary were ablated. All these patients except one (28) recovered from the operation and from the condition. Case 28 died three weeks later from bronchopneumonia.

VENTRAL HERNIA

Cullen's case (31b) is the only case of spontaneous ventral hernia of an internal genitalia included in our article. In this case the hernial opening was in the right lateral abdominal wall below and to the right of the umbilicus but at least 12 cm. from the inguinal region. It is possible, Cullen says, that this weakness in the wall had become accentuated during a pregnancy, the patient being an eleven para, and that the ovary during its ascent with the pregnant uterus had dropped into the cavity. The hernial content was a kidney-shaped multilocular ovarian cyst, 12x7x6 cm. It showed no signs of malignancy.

POSTOPERATIVE VENTRAL HERNIAS OR HERNIAS IN ABDOMINAL SCARS

The protrusion of parietal peritoneum with stretching of the cicatrix over it may occur after any operation or other penetrating wound of the abdominal walls, except those of very small dimensions.

Though these hernias may occur in any part of the abdominal wall, they are located almost always either in the median line or in the region of the appendix. Owing to the employment of improved operative technique, and to the more rigid observance of the requirements of surgical asepsis, postoperative hernias are decreasing in frequency.

There are two types: In one, there is a uniform distension of the cicatricial tissue producing a condition somewhat analogous to separation of the recti muscles; in the other, the hernia is due to the giving way of weaker portions of the scar.

The main predisposing etiological factors of postoperative hernias are:

1. Long incisions.
2. Faulty closure of abdominal wounds.

a. Placing sutures at too wide intervals. Slipping of knots.

b. Use of catgut suture material which is prematurely absorbed, that is, which is absorbed before organic union of the approximated tissues has been effected.

c. Faulty coaptation of margins of divided tissues.

d. Exclusive employment of through-and-through sutures. Laparotomies in which the different layers of the abdominal wall have been sutured separately show a much smaller percentage of hernias than those in which the abdominal wound has been closed only by through-and-through sutures.

3. Operations for suppurative processes which of themselves require, for healing, that the abdominal wound be maintained open for a considerable period of time.
4. Drainage.
5. Disturbed wound healing. Imperfect asepsis. Suppuration.
6. Failure to wear for some months after recovery from operation, a well fitting abdominal binder.
7. Too early pressure upon the scar.
8. Pregnancy.

The only postoperative ventral hernia of the uterine appendages which figures in our tables is a tubo-ovarian hernia (74) in an abdominal scar resulting from the opening and prolonged drainage, ten years previously, of an appendical abscess. The scar was about six inches in length. Cullen, to cure this case, resected the entire cicatrix, loosened the adhesions of the omentum to the ovary; then removed the herniated ovary and hydrosalpinx and followed this by closure of the abdominal wound without drainage. A satisfactory recovery was obtained.

It is not at all uncommon to have recurrence after operations for hernias in abdominal scars.

In this case as in many other postoperative ventral hernias, the sac was incomplete for a considerable distance; and the ovary lay directly beneath the skin.

The frequency of postoperative hernias will be lessened if operators, in addition to keeping in mind the etiological factors, avoid cutting nerves in their lines of tissue division;

if they employ, when possible, "gridiron" incisions and supplement their through-and-through sutures by "layer by layer" sutures.

In the treatment of postoperative ventral hernias, one can choose between two methods; in both, a complete freeing and removal of the sac as well as of all scar tissue is imperative. In one, the different layers of the abdominal wall are dissected and separately sutured: peritoneum, fascia, muscles, aponeurosis, subcutaneous tissue and skin; in the other, the layers are overlapped, imbricated.

GLUTEAL, SCIATIC, OR ISCHIADIC HERNIAS

This is a very uncommon condition; in the medical literature of the last one hundred and fifty years, only twenty-three cases of ischiadic hernia are recorded (E. Koeppl) (8). Gluteal, sciatic, or ischiadic hernias escape from the abdominal cavity by way of either the greater or the lesser sacrosciatic foramen. There are three varieties: The suprapyriformis, the infrapyriformis, and the spino-tuborosa. These hernias may be congenital or acquired, may occur on either side of the body and are subject to all the complications of hernia in general. Thirteen of the cases on record were observed in women. Schilbach's case of "hernia ischiadica ovarii dextri incarcerati spino-tuborosa" is the only case on record of an ischiadic hernia making its exit through the lesser sacrosciatic foramen. The diagnosis was first made at the autopsy table. During life, there had been genital hæmorrhage and symptoms of ileus. At the postmortem examination, the ovary was found in the hernial sac, the tube and broad ligament being caught in the hernial ring.

We found only two cases of ischiadic hernia of the uterine appendages. Both were acquired hernias of the right tube and ovary, occurring in multiparous patients. Both were subjected to operation and recovered. In Chénieux' case (72), it was not determined whether the hernia present had escaped above or below the pyriformis muscle. Without an anatomical dissection, it is difficult, in the individual case, for the surgeon to determine with which one of the three varieties of ischiadic hernias he has to deal. Chénieux removed the herniated ovary and tube and carefully sutured the pedicle to the parietal peritoneum of the small pelvis and to the hernial orifice. Recovery ensued.

Woelfler's case (8) is interesting in that it was successfully subjected to an operation for radical cure. The hernia, infrapyriformis in kind, emerged like all others of its type along the lower border of the pyriformis muscle in close relation to the internal pudic, inferior glutéal, and sciatic nerves and vessels. For the previous two years, the patient had had attacks of pain radiating along the course of the sciatic nerve, and abdominal suffering associated with nausea and, at times vomiting. In the right gluteal region, there could be palpated below the muscles, a globular, fluctuating, fist-sized, non-reducible swelling from which, at one time, there was removed by aspiration fifty cubic centimeters, and, at another time, five hundred cubic centimeters of dark reddish fluid containing much albumen, red blood corpuscles and leucin-tyrosin crystals.

The following operation was performed: An eight centimeter long incision, parallel to the course of the fibers of the gluteus maximus, was made over the summit of the hernial swelling. The muscle fibers were separated; the hernial sac exposed, isolated and opened. It contained the ovary and the end of the tube. The sac contents were ablated; the resulting stump reduced in the abdominal cavity. The sac was then ligated and cut off, after which, the operator closed the hernial orifice by approximating the pyriformis muscle to the lesser sacrosciatic ligament.

In cases of strangulated ischiadic hernia E. W. Andrews, Chicago, recommends the following steps:

a. External incision, opening hernial sac, inspection and disposition of contents.

b. Median abdominal incision to afford access and to repair intestinal lesions.

OBTURATOR HERNIAS

In obturator hernias, the herniated viscus or viscera, always escapes from the abdominal cavity by way of the obturator or subpubic canal. This osteofibrous canal is formed partly by the bifurcation above of the internal and external obturator membranes and partly

by the under surface of the pubic bone; under normal conditions it only transmits the obturator nerve, artery, and veins; it is directed downward, forward, and inward, presenting an internal or pelvic orifice and an external or obturator orifice. It is about 3 cm. in length and has a transverse diameter of about 1 cm. the superior concavity embracing the inferior convexity of the pubic groove.

These hernias, though less infrequent than ischiadic hernias, are nevertheless uncommon; not more than two hundred cases are recorded in the medical literature. Owing to the greater capacity and greater transverse diameters of the female pelvis, to pregnancy (case 126 was a 4-para), and to other factors, obturator hernias are found more frequently in the female, and usually in elderly females; the cases in our tables being 66, 68, 72, 78 and 87 years, respectively. In case 9, it seems probable that the increased intra-abdominal pressure was due to straining during defecation in order to overcome the constriction caused by a thickened middle valve of Houston.

They are usually small; may be unilateral or bilateral; are more frequent on the right side (9, 101, 126); may coexist with hernias of a different type. Case 9 was a right obturator hernia of the middle portion of the right Fallopian tube and adjacent mesosalpinx, existing in an individual who also presented a left obturator hernia of the bladder and a right crural intestinal hernia. Case 126 was a left obturator tubo-ovarian hernia coexisting with bilateral reducible femoral hernias of different contents.

They may be reducible (9, 101), irreducible (18), or strangulated (123, 126).

In case 9, the tube was the sole hernial content; in case 18, in addition to the tube, the sac contained a loop of small intestine and a piece of omentum. Cases 101, 123, and 126 were obturator tubo-ovarian hernias; the latter two contained, in addition to the uterine appendages of one side, a loop of gangrenous gut.

Picqué and Poirier recognize three main anatomical varieties of obturator hernia. In the first variety, the most common, the hernia follows the entire course of the obturator canal, appearing as a swelling in front of the external orifice of this canal. In the second variety, the hernia escapes from the abdominal cavity through the pelvic orifice of the subpubic canal, but following the course of the inferior division of the obturator nerve does not traverse the canal's entire length, and makes its exit by passing between the superior and middle bundles of the obturator externus muscle. In the third variety, the hernial protrusion also enters the pelvic orifice of the obturator canal, but becomes lodged between the obturator membrane and the obturator externus muscle.

In the first two varieties, the pectineus muscle overlies the hernial swelling. Lickley's case (101) belonged to the first variety; the posterior surface of the flask-shaped hernial sac rested on the obturator externus muscle, the thick upper border of which lay immediately below and behind the sac's neck. The strong aponeurosis underlying the pectineus muscle bound down the sac anteriorly. Gladstone's case (9) belonged to the third variety; the sac had escaped from the pelvis through the internal orifice of the obturator canal and lay imbedded in a mass of fat beneath the obturator externus muscle.

Rarely has the diagnosis of obturator hernias been made previous to the occurrence of strangulation. Cases 9 and 101 were dissecting-room discoveries; in case 18, the clinical diagnosis was "unusual femoral hernia." Case 123 has been diagnosed "strangulated femoral hernia." In this case, the neck of the hernial sac was constricted between the bone and the moderately sharp upper border of the obturator membrane.

Objective symptoms are frequently absent. When a swelling is visible and palpable, it is usually of small volume and is located in the most internal portion of Scarpa's triangle, somewhat resembling a femoral protrusion. It is, however, non-pediculated and does not extend in the direction of the crural canal. In case 18, a small spherical egg-sized tumor was present in the most internal portion of Scarpa's triangle; in case 123, a swelling in upper part of Scarpa's triangle is noted. Howship-Romberg's phenomenon, neuralgic pains and cramps along the course of the

obturator nerve, is an important symptom. However, it is not a constant symptom and has been observed infrequently in other conditions, such as osteomyelitis of the pubic bone, pelvic suppurations, etc. It was present in 18, 123, and 126. Obturator nerve may be irritated by other conditions than a hernia. The obturator nerve is a motor-sensory nerve, and the pain and other sensory disturbances referred along the inner side of the thigh to the knee or to a point a little below the knee, sometimes to the region of the hip-joint, and known as Howship-Romberg's symptom, are apparently due to compression of the nerve by the hernial protrusion. In suspected cases, one should always determine whether there is increased pain when the obturator externus is put under tension: abduction and rotation inward of the thigh.

Vaginal examination is important. The internal orifice of the subpubic canal is accessible to the vaginal hand. Picqué (18) felt with the examining vaginal hand a cord extending into the subpubic canal and could palpate the abnormally enlarged internal hernial orifice.

In cases 101 and 126 the body of the uterus was deflected toward the inner hernial opening. The high mortality which has followed operative treatment for strangulated obturator hernias is due to various factors:

a. The advanced age of the patients.

b. The non-recognition of the condition until serious or fatal anatomical lesions had developed.

c. Unfavorable influences under which the operations were performed.

Two routes are advised for the treatment of obturator hernias: The abdominal route and the obturator route. Zinner advises laparotomy in all obturator hernias in which there is a suspicion of incarceration of gut. The narrowness of the hernial opening makes it difficult to properly determine with an obturator incision the condition of the fixed loop of gut. A median abdominal section enables the operator to more properly resect the gut. In Schwarzchild's case (9) of obturator hernia there was no bulging in the adductor region and no local tenderness. In such cases, laparotomy is strongly urged.

In the obturator route, the following steps are employed:

1. An incision 8 cm. long is made about 3.5 cm. internal and parallel to the femoral artery.

2. Separate with a grooved sound the internal border of the pectineus muscle from the outer border of the adductor brevis and adductor longus muscles.

3. If necessary, divide a few of the fibers of the pectineus muscle close to their insertion on the pubic bone, so as to facilitate digital exploration of the obturator region.

4. Expose, isolate, and open sac; determine its relation to the obturator nerve and vessels, after which nick constricting point, if hernia be strangulated, and reduce or ablate hernial contents.

5. Remove sac; suture muscles overlying obturator canal.

6. Closure of wound.

FEMORAL HERNIAS

Hernias which in their escape from the abdominal cavity pass between Poupart's ligament and the horizontal ramus of the pubis and sooner or later protrude in Scarpa's triangle are called femoral hernias. All the crural hernias collected in our tables belong to the type known as common femoral hernias. Common femoral hernias escape from the abdomen through an orifice bounded anteriorly by the most internal portion of Poupart's ligament; posteriorly, by the horizontal ramus of the pubis; externally, by the femoral vein and the sheath of the femoral vessels; internally, by Gimbernat's ligament. They descend along the most internal compartment of the femoral sheath and ultimately emerge through the saphenous opening. These hernias are contiguous to the femoral vein, which always lies external, and they carry along in their progress through the crural canal a mass of condensed areolar tissue, known as the septum crurale. They show a greater tendency to expand upward than downward because the cribriform fascia is less adherent to the upper margin of the saphenous opening.

We could not find in the medical literature of the last twenty years any uncommon types of tubal, ovarian or tubo-ovarian femoral

hernias, such as those in which the hernia escapes through a gap in the fibers of Gimbernat's ligament; or the pectineal form, in which the hernia, after entering the internal femoral ring, burrows downward through the pectineal fascia and develops between the pectineus muscle and its aponeurosis; or external crural hernias in which the hernial sac is found either directly over the femoral vessels or distinctly external to them. The very uncommon forms, hernia cruralis retrovascularis and hernia cruralis properitonealis, were also absent.

The small number (sixteen cases) of femoral hernias which we were able to collect, as compared to inguinal hernias, confirms the now accepted but previously disputed fact that, in the female, inguinal hernias are of more frequent occurrence than femoral hernias. All these femoral hernias were of the acquired type; it is known that congenital femoral hernias are pathological rarities. In thirteen cases, the patients, at the time that they came under observation, ranged in age from forty to seventy-five years; the remaining patients were thirty-six and thirty-seven years old, respectively (12, 13, 20). Femoral hernia is essentially a hernia of adult life. Either side of the body may be involved. All our cases were unilateral. The tendency to double femoral hernia is less than that to double inguinal hernia. In one case, the side affected is not stated; of the remaining fifteen, five were left-sided and ten were right-sided. All femoral hernias irrespective of contents or of sex of bearer are of more frequent occurrence on the right side (Wernher, Macready, Berger). In case 20, there coexisted a left-sided omental femoral hernia. These hernias are not all of the same development; some are small and some are larger. Most femoral sacs are small and have a globular form. The walls of the crural canal and the femoral rings are incapable of great enlargement, hence femoral hernias seldom attain a large size; they are often overlooked. Cases 7, 10, 11, 12 and 37 were hen's egg-sized; case 13, was fist-sized; case 42, the size of two fists; case 1b, the size of a grapefruit. Four of these femoral hernias were ovarian (34, 37, 38, 42); all the others were tubal. No femoral tubo-ovarian hernia was found. In Andrews' case (1a), the hernia is said to have followed heavy lifting while patient was eight months pregnant. The influence of pregnancy, as an etiological factor, is shown in case 10, a primipara; in cases 1b, 7 and 42, 2-para; in case 38, a 6-para; in case 12, an 8-para. Femoral hernia appears with greatest frequency during the child-bearing period (Coley).

The tubal hernias contained the oviduct either in part (1b and 20, fimbriated end of tube; 13, external half of tube) or in its entirety (3, 7, 17), alone or associated with intestine (1a, 4, 11), omentum (17) or both. In Maydl's case (15), the hernial sac contained blood-stained fluid, the appendix vermiformis and a portion of the Fallopian tube. The strangulated portion of tube was within the abdominal cavity. The presence of the appendix vermiformis in a femoral hernial sac is rare. Coley states that in 2,200 cases of hernia operated upon from 1890 to March, 1908, in the Hospital for Ruptured and Crippled, the appendix vermiformis alone was found in 10, the cecum and appendix together in 7. In not a single one of Coley's cases was the appendix found in a femoral hernial sac (W. B. Coley, Keen's Surgery, 1908, vol. i, p. 78).

These hernias may be reducible (13), irreducible (1, two cases, 7, 10, 20, 34, 37) or strangulated (3, 4, 11, 12, 15, 17, 38, 42). Case 4 had had previous attacks of strangulation which had yielded to taxis. It is thus seen that half of these hernias were strangulated. Strangulation is a frequent complication in femoral hernias; these hernias are small, their importance underrated and truss treatment very imperfect. Strangulation can occur at any one of the following sites:

a. Internal femoral ring.
b. Margin of Gimbernat's ligament.
c. Margin of the saphenous opening.
d. Meshes of the cribriform fascia.
e. Irregularities in the hernial sac.

In case 3, the tube was strangulated by the neck of the sac; case 23 contained, in addition to the oviduct, a loop of gangrenous and ruptured small intestine which had been caught by an old adhesive band.

Femoral hernias of the uterine adnexa are

not accompanied by very characteristic symptoms; frequently the condition is misdiagnosed. Many tubal or ovarian femoral hernias are not, in the absence of complications, associated with marked functional disturbances. The presence, in the femoral region, of a small tumor always tender to the touch though no thought of inflammation be present, enlarging and becoming painful during the menstrual period, is suggestive. If the hernial sac contain intestine or omentum, in addition to the tube or ovary, the clinical picture is more complex. Careful vaginal and vagino-abdominal examination, and a thoughtful analysis of the history of the case, enable the surgeon to almost always make a correct diagnosis. Adenitis, psoas abscess, saphenous varix, lipoma, and hypertrophy of the properitoneal fat are conditions to be considered in the differential diagnosis.

We find the symptoms, pain and tenderness, noted in 20, 17, 34, 37, 38; menstrual disturbances in 3 and 13. In the strangulated cases, the symptoms were more those of inflamed than of strangulated hernias. In case 13, on bimanual vagino-abdominal examination, the deviation of the uterus to the front and to the left was demonstrable. Impulse on coughing is an inconstant symptom; it was absent in case 7.

The following operations were performed:

1. Amputation of fimbriated end of tube (1b). This hernia had previously been treated by injection but had recurred.
2. Incision of hernial swelling and creation of an artificial anus (23).
3. Ablation of tube (3, 12).
4. Ablation of ovary (37, 38).
5. Ablation of tube and ovary (7).
6. Excision of hernial sac and return of tube to abdominal cavity (1a, 4, 17, 20).
7. Removed tube and ovary and resected gangrenous intestine (11).

In case 13, a cystic dilatation of the Fallopian tube formed a fist-sized hernia below a line extending from the pubic spine to the anterior superior spine of the ilium. The hernial mass was incised and two pounds of clarified purulent fluid evacuated. Drainage was employed. In Maydl's case (15), the appendix and the tube and ovary were removed. In Parsche's case (42), the hernial contents was a multilocular ovarian cystoma 6x4 cm.; it was removed. In case 34, the procedure employed is not stated. All but two cases recovered. The two deaths were 11 and 23. In both, the hernial sac contained gangrenous intestine and the patients were moribund at time of operation.

Truss treatment of femoral hernia is notoriously unsatisfactory and is considered as being only palliative and not at all curative. In femoral hernias, on account of the motions of the thigh, it is difficult to apply and especially to maintain pad-pressure in a position conducive to closure of the hernial openings.

By operation, a radical and a permanent cure can be obtained. The results are better in small than in large hernias; in recent hernias, better than in those of long standing. We urge that all femoral hernias of the uterine adnexæ be subjected to an operation for radical cure. It is the only rational and efficient treatment of crural hernias. Many operative procedures have been devised, recommended and employed in the radical cure of femoral hernia; not one has, up to this time, found universal acceptance. Ochsner always opens the sac and then reduces the hernial contents. After isolation and high ligation of the sac, he removes it as well as the fat which surrounds the canal and fills the region of the femoral ring. He considers these few simple steps ample and efficient for cure. He says: "It is a well-known fact that it is practically impossible to keep a circular opening in any part of the body from closing spontaneously unless it is lined by a mucous or a serous membrane." (A. J. Ochsner, Femoral Herniotomy, Journal of American Med. Assn., 1906, vol. 47, p. 751.) Coley, whose clinical experience with the treatment and cure of hernia is greater than that of any other living American surgeon, supplements high ligation and ablation of the hernial sac and the thorough removal of all extraperitoneal fat with the following step: He introduces a purse-string suture of kangaroo tendon in such a way as to bring the floor of the femoral canal in contact with the roof. Coley states: "The results of this purse-string method have been so nearly

ideal that there is seldom need of resorting to more difficult and complicated methods."

I almost always follow Berger's technique, using, however, only absorbable suture material. It consists of the following steps:

1. Exposure of hernial sac by a longitudinal skin incision extending from about three centimeters above Poupart's ligament to six centimeters below. This incision is parallel to and one centimeter internal to the femoral vein. An oblique incision parallel to Poupart's ligament may be used.

2. Isolation and incision of hernial sac; inspection and reduction or ablation of hernial contents.

3. High ligation and amputation of sac, plus fixation of sac-stump to abdominal wall. The sac is tied off well beyond the neck, at the point where it begins to widen out into the general peritoneal cavity. Portion of sac distal to ligature is removed. The two ends of the ligature are left long and needled. The sac-stump is carried upward in the properitoneal cellular tissue and then fixed about three centimeters above Poupart's ligament by passing the needled ligature ends separately and about one centimeter apart, from behind forward through the musculo-aponeurotic layer of the abdominal wall, after which they are tied and knotted on the anterior surface of the external oblique aponeurosis. Fixation of sac-stump well above site of crural canal is said to minimize, according to some, to prevent, the liability of peritoneal bulging at the site of femoral ring. It is well to remove any overlying masses of fat lymphatic glands and hernial cysts present in this region.

4. Occlusion of the hernial canal. Three or four concentric or purse-string sutures are inserted, being superposed from behind forward. Their purpose is to approximate the pectineal fascia to Poupart's ligament and to the external oblique aponeurosis.

5. Approximation of the overlying tissues.

Whatever method is adopted, care must be taken that the approximated tissues exert no compression on the femoral vein.

INGUINAL HERNIAS

Hernias which escape from the abdominal cavity, either through the internal or external inguinal fossa, and which emerge upon the surface when complete by way of the external abdominal ring, are known as inguinal hernias.

Of all hernias, inguinal hernias are the ones most frequently noted in the female.

There appear in our tables and in the text only twenty-five hernias of the uterine appendages, of one or other of the following types: Ventral postoperative, ischiadic, obturator and femoral, as compared to one hundred and ninety-six inguinal hernias, one hundred and seventy of which were unilateral and thirteen bilateral.

Inguinal hernias of the uterine adnexa may be complete or incomplete (57). In the incomplete form, the hernia has not escaped beyond the external abdominal ring. Inguinal hernias may be right-sided or left-sided. Thirty-eight of our cases are definitely known to have been right-sided, forty-five to have been left-sided; in many cases, the side involved is not stated. They may be unilateral or bilateral; as previously stated, all the bilateral hernias of the uterine adnexæ, tubal, ovarian or tubo-ovarian, recorded in the medical literature of the last twenty years, were of the inguinal variety. They may be reducible or irreducible (over eighty of the inguinal hernias included in our tables were, at time of report, irreducible). They may be strangulated or be the seat of torsion. This last accident has only been observed in congenital inguinal hernias, the contents of which were irreducible.

Of the uncommon types of inguinal hernias, there were only a few cases. There was one direct hernia (92). This, especially in the female, is an uncommon form. The main characteristics of direct hernias are that the protrusion takes place by way of the internal inguinal fossa, that the neck of the sac is always to the inner side of the deep epigastric vessels, and, in the female, that the round ligament is distinct from and to the outer side of the sac. Coley says that he has only seen one case of direct hernia in the female sex (10). We found three interstitial or intraparietal hernias. In this type of inguinal hernia, the protrusion insinuates itself and develops between two layers of the abdominal wall, and has one of the following locations:

a. Between the aponeurosis of the external oblique muscle and the skin.

b. Between the internal oblique and the aponeurosis of the external oblique.

c. Between the transversalis and the internal oblique muscles.

d. Between the peritoneum and the transversalis fascia, extending either toward the iliac region or in front of the bladder.

Nicoll (40) does not specify to which variety the interstitial hernia which he reports belonged. He merely states that the herniated ovary occupied an interstitial chamber in the abdominal parietes. As he could not make the ovary pass through the internal ring, he removed it. In Launay and Wiart's case (96a), the hernial sac was upon the anterior surface of the external oblique and extended from the external abdominal ring obliquely upward and outward toward the anterior superior spine of the ilium.

In Tubby's case (133) of interstitial inguinal hernia of both ovaries and both tubes, the prominent part of the swelling was found between the left internal oblique and transversalis muscles.

All the other inguinal hernias were of the ordinary type: that is, external or indirect or oblique. An ordinary or oblique inguinal hernia in its course through the inguinal canal (narrower in the female than in the male) is accompanied by the round ligament; as it escapes from the external abdominal ring, it appears in the upper portion of the labium majus, in which it descends to a greater or less extent.

Inguinal hernias vary in size and in form. Case 52 was hazelnut-sized. Cases 7, 19, 25, 26, 55, 71, and 125 were walnut-sized. Case 30 was hickorynut-sized. Case 66 was plum-sized. Cases 27, 75, and 105 were pigeon's egg-sized. Cases 5, 49, 78, and 100 were hen's-egg-sized. Case 84 was goose-egg-sized. Cases 35, 46, 74a, and 89 were fist-sized. Cases 95, 116, and 118 were orange-sized. Case 87 had the size of two fists. Inguinal hernias may be almond-shaped (26), ovoid (31, 49, 133), sausage-shaped (35), pear-shaped (93, 76), globular (122) or other forms too numerous to mention.

SYMPTOMS AND DIAGNOSIS

Hernias of the uterine appendages present all the symptoms common to hernias in general. In some hernias of slow and gradual development, owing to the absence of symptoms, the patient often ignores the fact that he has a rupture. Some cases do not give rise to any symptoms. (No clinical record, operating-table, dissecting or autopsy room discoveries.) Some give rise to very slight disturbances. Many remain painless until the appearance of the menses, and then are first recognized at about the age of puberty. Pain may be absent during the entire course of a slowly developing hernia. In other cases, the hernial swelling may be so small as to be completely overlooked by a careless observer. Inspection, palpation, and percussion of the hernial regions are routine steps in the examination. In cases 87 and 120b, the percussion note was tympanitic; in cases 88, 96, 100, 109, 118 and 120a, it was dull. After having demonstrated the presence of a hernia, the operator has to determine the type of hernia present and the nature of its contents. The existence of other malformations is to be ascertained, as they may be of such a nature as to partially justify the sacrifice of healthy herniated organs. For instance, cases 65 and 77 were bilateral tubo-ovarian hernias, in which there was also an absence of the vagina. In the former, Bullitt made a unilateral castration and reduced the other adnexæ. In the latter, Delay removed the contents of both hernial sacs. Parker (117) removed the hernial contents in a case of bilateral inguinal hernia of both tubes and ovaries, in which the vagina and the cervix uteri were absent. Aue's case (24) was one of bilateral irreducible inguinal hernia each containing an ovary. The mammæ and the external genitalia were under-developed. Aue failed to discover the uterus; probably, it was absent. He reduced both ovaries into the abdominal cavity. A rectal examination is called for so as to demonstrate the position and the presence of the uterus. In Delay's case, rectal examination did not reveal the presence of a uterus. In case 26b, it showed the uterus to be small and anteflexed; in case 55, the infantile type of the pelvic organs (patient was thirty-five years

old); in case 79, it showed the uterus to be of normal dimensions.

Clinicians usually do not experience any difficulty in diagnosing a hernia; at times, they are in doubt as to the type of the hernia present in the case at hand. In fatty individuals, the exact position of the hernial neck is difficult to determine. Obturator hernias are rare, and are found internal to the femoral opening; in femoral hernias, the swelling is found to be almost if not entirely below a line extending from the anterior superior iliac spine to the pubic spine (13); "mass was below Poupart's ligament" (37). The peduncle of a femoral hernia lies immediately behind the tumor mass, whereas in inguinal hernias it extends upward and outward. In inguinal hernias, such conditions as the following are present: "Swelling could be traced to external abdominal ring" (35); "Swelling was above Poupart's ligament" (49); "Swelling occupied the whole left labium" (97); "Small swelling in labium majus" (106); "Swelling extended from internal abdominal ring to the left labium majus" (109); "Hard tender swelling in right labium majus continued in the inguinal canal as a firm cord-like projection" (114).

In the female, the tumor mass caused by a complete oblique inguinal hernia, even of a moderate size, will cause a swelling extending into the labium majus (66, 76, 81, 91, 97, 103, 109, 116, 118, 119, 122, 132).

In some hernias of the uterine appendages, the patients complain of a feeling of weight and discomfort. In case 31, an inguinal hernia of the right ovary, pressure upon the hernial swelling excited a sickening sensation. The special sensitiveness of the ovary is said not to appear before the age of puberty. The symptom "tenderness on pressure" we find frequently repeated (17, 18, 20, 29b, 37, 56, 58, 78, 80, etc.). Some of these hernias are painless (19); some are so painful as to interfere very much with the patient's well-being. In case 51, locomotion was difficult. In case 113, when patient stands and when she coughs, hernial swelling increases in size. Impulse on coughing is not infrequently noted. It is not, however, a constant symptom, present in cases 1, 2, 7b, 19, 45, 82; it was absent in cases 16, 54, 109, 115. These last four hernias were all irreducible inflamed inguinal hernias. When a hernia becomes strangulated an impulse on coughing or with any other increase of the intra-abdominal pressure can no longer be felt; this is due to the fact that the hernial orifice is shut off entirely. In case 112, an inguinal hernia with twisted pedicle, when child cried the hernia remained unaltered in size. Menstrual disturbances are recorded (3). Painful menstruation was a source of complaint in cases 12, 13, 26, 27, 33, 35, 128, 134. Enlargement and increased tenderness of the hernial swelling during the menstrual period were noted in cases 25, 28, 29, 63, 69, 96, 100, 128. Absence of menstruation existed in the following adults: Cases 32, 55, 65, 74a, 77, 98, 99, 117, 127. This absence of menses is explained as follows: In cases 32 and 65, the vagina was absent; in cases 98 and 99, it was imperforated; in cases 55 and 127, the uterus had no cavity; in case 74a, there was no cervical external os; in case 117, there was no cervix uteri; in case 77, there was no uterus. The presence of uterus in the hernial sac may not determine any menstrual disturbance (63, 93).

If after inspection and palpation of the hernia, the medical attendant is still in doubt as to the nature of the hernial contents, a bimanual vagino-abdominal examination should be made. In case 24, ovaries could not be palpated in abdominal cavity; in case 26, right adnexa were not palpated. In many unilateral hernias, this examination demonstrates a deviation of the uterus toward the hernial side (13, 22, 46, 64, 84, 96, etc.). The uterine adnexa, in passing into the inguinal or into the crural canal, drag the corresponding uterine horn toward that orifice, and it has frequently been noted in these cases that the anterior surface of the uterus was turned toward the side opposite to the hernia, owing to the torsion of the uterus upon a vertical axis. By forcibly pushing the uterus to one or the other side, movement may be transmitted to the hernial mass. In case 84, fundus moved when traction was made on the hernial swelling. If the hernia be bilateral, the uterus will be drawn forward, immobilized, and held as if impacted in its forward position. Vaginal and vagino abdo-

minal examination in these cases, conveys information as to the position and the condition of the non-herniated pelvic organs. In case 24, on bimanual vagino-abdominal examination, the ovaries, could not be palpated in the abdominal cavity, in case 26, right adnexa were not palpable in abdominal cavity.

If an oblique inguinal hernia be incomplete, that is, if it does not extend beyond the inguinal ring canal, it may be mistakenly diagnosed tumor of the spermatic cord, bubo, epiplocele, or encysted hydrocele of the canal of Nuck. In cases 70, 114, and 120, the clinical diagnosis was inflamed encysted hydrocele of the canal of Nuck. In cases 45 and 120 (two cases), the clinical diagnosis was inguinal epiplocele. If a bubo be present, there will be some inflammatory lesion (or a history thereof) in the region drained by the afferent lymphatics. In the other conditions, tumors of the round ligament, epiploceles, encysted hydroceles of the canal of Nuck, the mistake in diagnosis is not very significant, as in all these conditions one must, to obtain cure, resort to operative treatment and to exposure of the inguinal canal.

TREATMENT

Six of the reported cases were either autopsy, table (52) or dissecting-room discoveries (9, 21, 22, 96, 101). In cases 34, 67, 107, 110, and 119, the nature of the operative intervention is not stated. In the other cases, the operators, after performing either a laparotomy or a herniotomy, disposed of the herniated organs either by reducing or removing them entirely or by removing a part and reducing the remainder. In some cases, the reduction of the hernial contents necessitated a preliminary division (39) or a dilatation (76) of the hernial rings (86), internal (120) or external (92).

The following table shows the operative procedures employed by the various operators.

I. Reduced herniated organs back into the abdominal cavity:

A. After a preliminary herniotomy:

1. Tube returned to abdominal cavity [1, 2, 5, 7, 20, 136 (two cases), 137].

2. Ovary returned to abdominal cavity [29, 41 (twenty-nine cases), 44, 45, 137 (eight cases)]. In case 24, previous to reduction of the ovaries, a pear-shaped cystic parovarium was removed.

3. Tube and ovary returned to abdominal cavity [57 (two cases), 61, 65, 71, 88, 96, 100, 108, 111 (two cases), 120, 128, 136 (three cases), 137 (eight cases)].

4. Miscellaneous:

a. Reduced tube and intestine (4).

b. Reduced tube and omentum (17).

c. Reduced ovary and intestine (39).

d. Returned tube, ovary, and intestine after dividing external ring (92).

e. Reduced entire tubo-ovarian apparatus (76).

f. Reduced cecum, appendix, uterus, tube, and ovary (87).

g. Reduced two tubes, one ovary, and uterus (99).

B. After a preliminary laparotomy:

1. Drew hernial contents, omentum, and Fallopian tube back into abdominal cavity (17).

II. Removed hernial contents:

A. After a preliminary herniotomy:

1. Removed tube:

a. Fimbriated end (1).

b. Diseased portion (14); adherent extremity of tube (104).

c. Entire tube (3, 8, 12, 19).

d. Entire tube and resected omentum (7).

2. Removed ovary [26, 30, 31, 35, 37, 38, 40 (nine cases), 42, 43, 47, 48, 50, 51].

3. Removed tube and ovary [6, 7, 10, 25, 33, 36, 59, 60, 62, 65, 66, 68, 70 (two cases), 72, 73, 74, 75, 78, 79b, 81, 82, 83, 86, 88, 94, 102, 103, 105, 106, 109, 112, 114, 117, 120, 122, 125, 128, 129, 130, 131, 132, 134, 135]. No. 10 was a tubal, 25, 33, and 36 were ovarian hernias, in which the operators removed the herniated organ and the corresponding adnexa.

4. Miscellaneous:

a. Removed ovary and abdominal end of tube (54, 80, 84, 126); ovary and part of tube (91, 97).

b. Removed ovary, tube, and parovarium (115).

c. Removed ovary, tube, and resected omentum (16, 121).

d. Removed tube, ovary, and mass resembling uterine tissue (118).

e. Resection of tube, ovary, and body to which they were attached (127).

f. Removed ovary, tube, and rudimentary uterine horn (113); ovary, tube and rudimentary uterus (47a).

g. Removed both tubes, right ovary, and supravaginal portion of uterus (89).

h. Removed two tubes, one ovary, and an infantile uterus (98).

i. Removed well-developed left and rudimentary right ovary, dilated tube, and bicornuate uterus (63).

B. After a preliminary laparotomy:

1. Removed tube and ovary [1 (two cases), 29].

2. Removed tube, ovary, and parovarian cyst (27).

3. Removed tube, ovary, and solid rudimentary uterus (55).

4. Removed ovary and rudimentary uterus (32).

5. Removed tube, ovary, and resected intestine (11).

6. Removed tube, ovary, and appendix (15, 95).

7. Removed Meckel's diverticulum, appendix, tube, ovary, and resected gut (56).

III. Reduced some of the hernial contents and removed the remaining portion:

A. Reduced intestine and removed ovary (46).

B. Reduced intestine and removed tube and ovary (79).

C. Reduced uterus and removed both tubes (58, 100).

D. Reduced uterus and removed tube and ovary (93).

E. Reduced intestine and uterus, and removed tube and ovary (116, 124).

In case 49, the hernial swelling was incised; pus escaped; there resulted a fistulous opening from which at each menstrual period there was a bloody discharge. In the intermenstrual intervals there was an absence of discharge. At the end of eighteen months, fistula closed.

Jordan (90) removed from the hernial sac a fœtus, an ovary, a part of the tube and a fringe of omentum, and reduced the herniated gut. Hilgenreiner's patient (87) was a nullipara who eight years previously had been operated for a strangulated right inguinal hernia containing gut, uterus and right adnexa. These organs had been reduced and the hernial sac closed. At time of second operation, she presented symptoms of strangulated right inguinal hernia. The hernial sac was incised and found to contain the cecum, appendix vermiformis, the uterus and the right tube and ovary. All these organs were reduced into the abdominal cavity; patient recovered.

In two hundred and thirteen operated cases the results are stated: Eleven deaths; two hundred and two recoveries. The results of operation are not stated in cases 46, 62, 67, 121, 129, and 131. Death occurred in cases 11, 18, 23, 28, 90, 93, 111, 123, 126, and 133. In cases 93 and 133 the cause of death remained undetermined. There were five hernias containing strangulated intestine — either gangrenous or on the verge of gangrene: Two femoral (11 and 23) and three obturator (18, 123, and 126). Case 28 died three weeks after operation from bronchopneumonia. In case 90, the following additional postmortem findings were found: Multiple intestinal stenoses, chronic interstitial nephritis, and right hydronephrosis. In case 111, in the course of the operation, patient had a bowel movement; fecal matter got into the wound, and infection resulted; at autopsy advanced pleural and peritoneal tuberculosis were demonstrated.

We advise that all hernias of the uterine appendages, irrespective of anatomical site or of size or of age of bearer, be subjected to an operation for radical cure:

a. If the hernia be irreducible.

b. If the hernia be strangulated.

c. If the pedicle of the herniated organ or organs be the seat of torsion.

After the age of two years:

d. If the hernia be bilateral.

e. If other hernias be coexistent.

f. When hernia cannot be painlessly, completely, and permanently kept reduced. Every time hernia was reduced, child cried (97).

g. If organs other than the uterine appendages be also present in the same hernial sac.

h. If the wearing of a hernial truss causes pain or aggravates the symptoms (28, 51, 55, 70, 96, 107, 117).

i. If the patient has to be subjected to ether or chloroform anæsthesia for the performance of an operation of election, double advantage can be taken of this anæsthesia, and an operation for the radical cure of the hernia performed.

j. If patient is exposed to pregnancy.

In the treatment of hernias, trusses are only to be considered as palliative agents. They are always a source of discomfort, and if improperly applied may inflict injury. Their prolonged use, by causing some atrophy of the lower border of the internal oblique muscle, diminishes the chances of radical cure by a subsequent operation. Truss pressure is harmful to the herniated uterine adnexa; it interferes with their nutrition and their normal development. In patients in the third or past the third year of life, having a hernia of one or more of the uterine adnexa, an operation for radical cure is always to be advised if there be no constitutional state contraindicating all operations of election. Why do we say three years? The limit, we admit, is somewhat arbitrary, and, it could be justly claimed, needlessly conservative. Clinical observation proves conclusively that many congenital inguinal hernias undergo spontaneous cure during the first two years of life. Authors differ as to the percentage of those spontaneous cures. De Garmo believes that 90 per cent of children under the age of three years are cured by truss treatment. Coley believes that one-half of the cases under three years are cured by this form of treatment.

Operation in uncomplicated hernias of tube, ovary or of tube and ovary is no more dangerous than the operation for the radical cure of other hernias. It has practically no mortality. Infants bear hernia operations remarkably well. Broca performed four hundred and fifty operations in children under fifteen years of age, with but one death.

The operation which has given the most universal satisfaction in the treatment of inguinal hernias is that devised by Bassini. It has the advantages of safety, simplicity and of efficacy. "Bassini's method is superior to earlier methods as well as to those since devised" (Coley). "In eleven hundred and eighty-five cases of inguinal hernias in which the typical Bassini operation was performed, there were nine relapses, seven-tenths of one per cent" (Coley). In all inguinal hernias in the female, in which Berger performed Bassini's operation, he never had a recurrence. Our tables show four recurrences (14, 59, 87, and 88). These last three recurrences were subjected to operation and recovery followed. The operative procedure employed is not definitely stated.

Bassini's operation for the radical cure of inguinal hernia meets the two most important, the two essential indications to be fulfilled in all operations for radical cure of inguinal hernias. These essentials are the suppression of the hernial sac and the upbuilding or strengthening of the abdominal wall at the hernial site. We advise operators to observe in their operations for inguinal hernia the following suggestions:

1. Always wear and have the assistants wear rubber gloves. Since the introduction of rubber gloves at the Hospital for Ruptured and Crippled Children, primary union has been obtained in 98.5 per cent of the cases. In Chicago, we look with disfavor and with distrust upon surgeons who operate with ungloved hands.

2. All ligatures and irremovable buried sutures should be of absorbable material. The purpose of sutures is to keep divided tissues in apposition until organic union has been effected. After this has been accomplished, sutures if not absorbed or not removed may originate irritation, may act as predisposants to inflammation, to sinus formation. We strongly condemn the use of silk for vessel ligation or for buried sutures.

3. Always divide the aponeurosis of the external oblique muscle to an extent sufficient to give a good exposure of the inguinal canal, and of its contents. In the female, the inguinal canal in its normal state and after a hernia operation, in its restored state, should outside of a few arterioles and nerve filaments, contain nothing but the round ligament, a structure much smaller than the spermatic

cord. This round ligament comes from the muscular structure of the uterus; it finally becomes lost in the labium majus. In a hernia operation, the round ligament if not the seat of disease, should never be sacrificed.

4. Always make a high and careful dissection of the hernial sac from the surrounding tissues, and especially from the round ligament to which it is often quite intimately adherent. The dissection of the sac from the round ligament is more difficult than the dissection of the sac from the spermatic cord.

5. Always open the sac and determine by direct inspection and palpation the nature and state of the hernial contents.

6. After reduction or ablation of the hernial contents the sac is to be transfixed and ligated as high as possible. Sac is then removed flush with the peritoneal cavity. This high and thorough removal of the sac is most important. So as to prevent the occurrence of peritoneal bulging at the internal ring, we are in the habit of anchoring or fixing the stump of the sac about two centimeters above this point. This is effected by needling each end of the ligature and carrying both ends separately and about one centimeter apart, upward in front of the properitoneal fatty cellular tissue, and behind the transversalis muscle for about two centimeters. The needles and ligature are then passed from behind forward through the transversalis internal oblique and external oblique muscles in front of which the ends of the ligature are tied.

7. Never sacrifice the round ligament; it is harmful to the statics of the uterus. Never transplant the round ligament; it is unnecessary. The round ligament is left undisturbed at the bottom of the wound, emerging at the lower angle of the latter; the internal oblique muscle is sutured to the shelving portion of Poupart's ligament; the divided margins of the external oblique aponeurosis are sutured and the skin incision closed. No drainage. After operation, no truss should be worn; a truss does not support the scar; it weakens it.

8. In the female, the internal and external abdominal rings can be closed without detriment to the patient. In operating on direct inguinal hernias, ligation of the deep epigastric artery is at times unavoidable.

In hernias of the uterine appendages, the operator must decide as to whether the hernial contents are to be returned to the abdominal cavity or whether they are to be removed. If a Meckel's diverticulum (56), or an appendix vermiformis (15, 56, 95) be an associated content, it should be removed. Hilgenreiner (87) deviated from this rule in returning an eight centimeter long appendix vermiformis into the abdominal cavity. He would have better served his patient's interests by removing the herniated appendix. Omentum present in a hernial sac, we always remove; especially is resection indicated if the herniated omentum is bound down by adhesions or if it has undergone fibroid thickening or conversion into a mass through adhesions of its folds (7c, 16, 18). If a portion of the urinary bladder (14, 64, 67) be present as an associated hernial content, it must be reduced uninjured in the abdominal cavity; if a cystic parovarium (24, 27), it should be removed (27); if a uterus, remove it if it be rudimentary (55); infantile or markedly diseased [uterus was strangulated and partly necrosed (89)]; otherwise return it into the abdominal cavity. The same rules will guide us with the intestine: If healthy, reduction; if diseased beyond redemption, resection (56) or creation of an artificial anus. Let there be no needless sacrifice of tissues or of organs.

As to the herniated tube, ovary, or tube and ovary. When normal, it goes without saying that irrespective of patient's age they should be returned to the abdominal cavity; if adherent to sac wall or to some hernial content, the adhesions are to be loosened or divided, and if the organ or organs do not show marked structural impairment, they are to be reduced. These organs when herniated should be removed, if they be the seat of:

1. Unavoidable or actual gangrene.

2. Benign neoplastic disease (mass showed the elements of a fibromyoma of ovary, 51).

3. Malignant neoplastic disease: Mass on microscopical examination proved to be a spindle-celled sarcoma of ovary (47).

4. Voluminous cyst formation (unilocular (33) or multilocular (42). "Ovary contained a multitude of cysts" (129). From ovarian cyst, six pounds of white liquid were removed

(70). Hydrosalpinx. "It was a cystic dilatation of the Fallopian tube, forming a hernia in the crural canal" (13).

5. Malformation or incomplete development (55).

6. Suppurative inflammation (121). Ovary showed areas of suppuration (48); bilateral pyosalpinx (58); abscess in tube (60). Tube is sausage-shaped and contains three abscesses separated from each other (82).

7. Hematoma or interstitial ovarian hæmorrhage (30). Repeated interstitial hæmorrhages had transformed this organ into a single cavity (28b). In case 103 on microscopical examination, ovary was seen to be full of blood and to contain numerous ova.

8. Seat of tubal gestation previous or subsequent to rupture of fœtal sac (90).

9. Tuberculosis limited to (119) or extending beyond the herniated organ. Ovary, tube, and sac were the seat of tuberculosis extending beyond the collar of sac (111).

10. Distortion beyond recognition. The mass removed, to the naked eye, resembled a kidney; microscopical examination showed that it was a tube and ovary (131).

11. Such pathological changes as prevent function. Tube was closed (79). Tube was as thick as little finger and four inches long (95). In case 79b, tube was obliterated, ending into a cul-de-sac. Often, even after the opening of the hernial sac, it is difficult to recognize the contents. Lejars (14) in his case recognized the tube by its caliber, its tortuosity and its fimbriated extremity.

SUMMARY

1. The Fallopian tube, the ovary, or the tube and ovary, in part or in their entirety, may be herniated. Degree may vary from a complete descent into a hernial sac, of the tube, ovary, or tube and ovary, to a condition where herniated viscus or viscera lie just without the abdominal ring.

2. The herniated tube, ovary, or tube and ovary may be the sole content of the hernial sac or there may be present as associated hernial contents one or two or more of the following structures or organs: Meckel's diverticulum, appendix vermiformis, omentum, urinary bladder, small or large intestine, rudimentary or fully developed uterus.

3. Tubal, ovarian, and tubo-ovarian hernias are congenital or acquired, unilateral or bilateral; exist alone or in association with one or more other hernias of the same or of dissimilar anatomical types, of the same or of dissimilar clinical characteristics.

4. These hernias, in a small proportion of cases, coexist with malformations, underdevelopment or absence of other internal or of some external genitalia: Imperforate vagina, absence of vagina, atresia of tube, unilateral absence of tube, of ovary, or of tube and ovary (32, 74a), rudimentary uterus, absence of uterus, etc.

5. In individuals having a herniated tube, an ovary, or a tube and ovary, pathological states of other internal genitalia or of some external genitalia may be present: Vaginitis, ovarian cystoma, uterine fibroid, uterine prolapse and other uterine displacements, etc.

6. These hernias may coexist with pathological states of organs other than the internal or external genitalia: Chronic hydrocephalus, multiple stenosis of intestines, hydronephrosis, etc.; these coexisting pathological states not having any relation of cause or effect to the hernial infirmity.

7. Congenital or acquired hernias of the tube, ovary, or tube and ovary, may develop at any period of life. These hernias have been observed in nulliparæ, in primiparæ, and in multiparæ. No age is exempt. No race is immune.

8. According to their anatomical site, hernias of the uterine appendages are designated as post-operative, ventral, gluteal, sciatic or ischiadic, obturator, femoral and inguinal.

9. Clinically, these hernias are reducible, irreducible, non-inflamed, inflamed, strangulated, or their pedicle may be the seat of torsion.

10. Torsion of the pedicle of a herniated ovary or of a tube and ovary, an accident peculiar to, and not infrequent in, hernias of the uterine appendages, gives the same clinical symptoms and determines the same anatomical changes as are observed in the strangulated hernias of the uterine appendages.

11. We were able to collect eight times as many hernias of the inguinal variety as of all the other hernial varieties put together.

12. Tubal, ovarian, and tubo-ovarian inguinal hernias are recent, old, or recurrent; are direct, interstitial or intra-parietal, indirect or oblique. If indirect or oblique, they are either complete or incomplete. A few sliding hernias are on record.

13. All the bilateral tubal, ovarian, or tubo-ovarian hernias recorded in the medical literature of the last twenty years were of the inguinal variety. In bilateral hernias, both hernias may or may not show the same degree of development; they may have appeared simultaneously or one may have appeared a shorter or longer time before the other. They may show similar or dissimilar clinical characteristics. When bilateral, one hernia may be irreducible and the other reducible.

14. All the hernias in which the complication "torsion of the pedicle" occurred were irreducible congenital inguinal hernias.

15. All the femoral tubal, ovarian or tubo-ovarian hernias recorded in the medical literature of the last twenty years were of the acquired type and appeared in advanced adult life. "Femoral hernia is essentially a hernia of adult life."

16. Hernias of the uterine appendages, in the absence of anomalies of the other internal genitalia or of the external genitalia do not if the herniated adnexa be of normal development and free from disease prevent conception, interfere with gestation, nor unfavorably influence parturition. Pregnancy can occur previous to, during, and subsequent to, the existence of hernias of this nature.

17. The etiology of hernias of the uterine appendages is that of hernia in general. As main factors should be cited: All conditions that weaken the abdominal wall, all conditions that increase the intra-abdominal pressure, and all conditions that increase the mobility of the uterine adnexa. Heredity, pregnancy, and the partial or complete persistence of the canal of Nuck are the most important predisposing causes.

18. The herniated organ or organs may be free from all degenerative changes.

19. The herniated organ or organs may be bound to the sac-wall or to each other; may be the seat of congestion, gangrene, hemorrhage, inflammation, suppuration, tuberculosis (primary or secondary), cystic and neoplastic disease (benign or malignant).

20. The herniated organ may be the seat of gestation.

21. The hernial sac and the herniated adnexa may be the seat of an inflammation, suppurative or other in character, which owing to progression by continuity of surface has extended upward from the vagina, presenting the following anatomical picture: Vaginitis, endocervicitis, endometritis, salpingitis or pyosalpinx, ovaritis and saccular peritonitis.

22. The hernial sac and the herniated contents may be the seat of an inflammation, suppurative or other in character, which originating in the vagina or in the uterus has reached the tube and ovary by way of the parametrial and parasalpingeal connective tissue.

23. Pathological processes originating in the hernial contents may, owing to extension by contiguity of tissue, involve the sac and its overlying tissues.

24. Pathological processes, primarily involving the sac or the overlying tissues, can spread to the hernial contents.

25. The hernial sac and the herniated tube, ovary or tube and ovary can become the seat of an inflammatory or other pathological process originating in the associated hernial contents, epiploitis, appendicitis, gangrenous gut, etc., infection spreading by contiguity of surfaces.

26. The herniated tube, ovary, or tube and ovary, and the associated hernial contents may be free of disease or the uterine adnexa may be normal and pathological changes be present in the associated hernial contents: appendicitis, gangrenous gut, epiploitis, etc.

27. The associated hernial contents may be normal and the herniated uterine adnexa be the seat of morbid changes.

28. It is at times difficult, at times impossible, to determine whether the anatomical changes present in the herniated organ or organs, developed previous to or subsequent to the displacement of the tube, ovary, or tube and ovary into the hernial sac.

29. Truss treatment for hernias of the uterine appendages is not curative, is often productive of discomfort, and not infrequently interferes with the nutrition and development of the herniated tube or ovary.

30. Women who suffer from any form of hernia should be carefully watched before, during and after their confinement so as to prevent or rather minimize any undue strain upon weak regions of the abdominal wall. These women, at the close of lactation or towards the end of the first year following their confinement, should, in the absence of contra-indications, be subjected to an operation for radical cure of the hernia.

31. After the second year of life, spontaneous cure of hernias of the uterine adnexa is rare and can occur only if the hernial contents are easily reduced and easily kept reduced.

32. In the female, all hernias irrespective of anatomical site, of clinical condition, or of nature of contents should, in the absence of a constitutional state contra-indicating operations of election, be subjected to an operation for radical cure. "That operation is the safest and most rational treatment of inguinal hernia in the adult is recognized at this time by almost every one" (E. S. Judd).

33. Clinical conditions so closely simulating hernias of the uterine appendages that a positive diagnosis without operation appears impossible, should be subjected to operative treatment. Only benefit can be derived from adherence to this rule. A diagnosis is established, and a cure is effected.

34. In hernias of the uterine appendages, as in all other hernias, the ideal time for operation is previous to the development of degenerative or other pathological states in the herniated organ or organs, and previous to the occurrence of any of the various complications incident to hernias. Early operations give the most satisfactory results.

35. The mortality of operations for the radical cure of hernias, if performed at an opportune time and by a rapid operator competently assisted, is practically nil.

36. To be effective, operations for radical cure of hernias must well fulfill two essentials: The suppression of the sac and the strengthening of the wall through which the hernia has escaped.

37. In all herniotomies, the sac should be incised and the hernial contents examined.

38. In the female, the inguinal rings are comparatively small. They can, without inconvenience to the patient, be closed.

39. The normal herniated tube or ovary should never be sacrificed. These organs have an important rôle and in the absence of marked structural impairment should be returned to the abdominal cavity. In case 31, on section ovary exhibited a well marked corpus luteum; in case 74, herniated ovary contained a partially organized corpus luteum. Intra-saccular intestinal and other adhesions must be separated.

40. The herniated abnormal tube, abnormal ovary or abnormal tube and ovary should be removed if their return to the abdominal cavity is associated with peril, immediate or remote, to the patient or if these organs are so altered anatomically as to be functionally worthless. In sacrificing tissues or organs, the surgeon must be economical.

41. Until we are better informed as to the frequency and nature of true and false hermaphroditism, removed herniated uterine adnexa not having a distinctive structure should be subjected to a microscopical examination. This will avoid mistaking testicular for ovarian tissue and vice versa.

42. In the treatment of strangulated sciatic or gluteal, obturator and femoral hernias of the uterine appendages in which the hernial sac also contains gangrenous gut, a double operation is almost always indicated: a laparotomy for the repair of the intestinal lesions, and a herniotomy for the radical cure of the hernia.

43. The herniated tube, ovary or tube and ovary can be removed through the usual herniotomy incisions. The operative steps for the removal of these herniated organs correspond, short of a laparotomy, to the technique ordinarily used in salpingectomy, ovariectomy, and oöphorectomy.

TABLE I.—TUBAL HERNIAS

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
	CASE 1. 56 years. First noticed 14 years ago. Acquired. Hernia is said to have followed heavy lifting while 8 months pregnant.	Left. Femoral. First reducible, then became irreducible. Tumor in left groin giving a slight impulse on coughing.	Loop of Fallopian tube, dark colored portion of ileum, portion of broad ligament.	Incision. Sac opened, dissected loose and excised. Tube returned into abdominal cavity.	Recovery.
	CASE 2. 45 years. While lifting heavy weight 12 years ago, a hernia appeared. Acquired. Two normal labors.	Right. Femoral. Not completely reducible. Firm, rounded tumor as large as grapefruit.	Fimbriated end of tube. Light yellow colored serum.	Treated by injection but returned. Amputated fimbriated end of tube.	Recovery.
1. ANDREWS, F., Hernia of the Tube Without the Ovary, J. A. M. A., 1905, vol. 45, p. 1625. 4 cases.	CASE 3. 33 years. Had existed 16 years. Acquired. Caused by carrying pails of water. Multipara.	Right. Inguinal. History of genorrheal infection three years previous, followed by salpingitis.	About one half of the tube was adherent together with omentum in hernial sac. Internal inguinal ring was patulous. Adnexa adherent on both sides.	Laparotomy. Removed the appendages and repaired the hernia.	Recovery.
	CASE 4. 23 years. Since birth. Congenital. Primipara.	Right. Inguinal. Pain and tenderness in right inguinal region with gradual development of swelling. Abdominal wall on right side was swollen and edematous; extending to anterior surface of thigh. Mass in pelvic cavity. Pelvic abscess due to rupture of right pyosalpinx with adhesions to anterior abdominal wall.	Tube. Pus could be seen escaping from the internal inguinal ring into peritoneal cavity.	Laparotomy. Pelvic organs on right side were matted together and covered by adherent omentum and intestine. Hernial abscess incised and drained.	Recovery.
2. BOUFFLEUR, Cook County Hospital. Case 350605.	17 years. Congenital (?). Has had hernia as long as she can remember. Nullipara.	Left. Inguinal. No symptoms of ileus. Slight impulse on coughing.	Normal Fallopian tube.	Tube returned into abdominal cavity. Bassini's operation. Separation of sac from round ligament.	Recovery.
3. BOUDIN, Trompe de Fallope dans une hernie, Lyon Méd., 1899, vol. 91, p. 231.	50 years. First noticed five years ago. Acquired. Woman had passed the menopause.	Femoral. First reducible; became irreducible about ten days ago. No digestive disturbance. Slight menstrual disturbances.	Tube. Tube was strangulated by neck of sac.	Ablation of tube.	Recovery.
4. BROCA, Hernie crurale gauche de la trompe étranglée, Bull. de la Soc. Anatomique de Paris, 1803, vol. 7, p. 86.	40 years. Acquired.	Left. Femoral. Strangulated for the last thirty-six hours. Hernia moderate sized. Has had previous attacks which yielded to taxis.	Quantity of fluid in sac. Fallopian tube and loop of strangulated small intestine.	Herniotomy. Tube and intestine returned into abdominal cavity. Excision of lipomatous sac.	Recovery.
5. DE FRANCISCO, Angewachsener Bruch der Tube, Beiträege z. Klin. Chirg., 1900, vol. 26, p. 389.	32 years. First noticed one and a half years ago. Acquired.	Left. Inguinal Not totally reducible. On coughing hen's egg-sized swelling seen. Somewhat painful. At times constipated. Has never shown symptoms of strangulation.	A solid cord which on examination proved to be the Fallopian tube.	Incision upon tumor extending to labium majus. Hernial sac opened, tube freed from adhesions as much as possible and reduced. Closure of sac.	Recovery.
*6. DOR, L., Ovaire et portions de ligaments large et rond contenus dans un sac herniaire, Lyon Méd., 1891, vol. 68, p. 442.	34 years. First noticed at age of seven years. Grandfather and father also had hernias.	Left. Inguinal. First reducible, then became irreducible. Has never noticed at menstrual period any enlargement or increased painfulness of swelling.	Round ligament entered into the formation of the sac wall; at level of internal orifice neck of sac gave to the finger the sensation of a sharp cutting band; tube was obliterated, ending into a cul-de-sac and only a few centimeters of its abdominal end were in hernial sac.	Removed tube, ovary, and hernial sac.	Recovery.
7. GARRIGUES, A., Les hernies de la trompe utérine, Thèse de Paris, 1904. 3 cases.	CASE 1. 20 years. Two years ago. Acquired.	Right. Inguinal. Walnut-sized swelling. Sensation of weight and discomfort.	Tube. It was normal and its fimbriæ were well separated.	Tube reduced into abdominal cavity. Radical cure for hernia.	Recovery.
	CASE 2. 64 years. Twenty days ago. Two para.	Right. Femoral. Irreducible. Painful, dull, egg-sized swelling giving no impulse on coughing.	Tube.	Removed tube and ovary after separating adhesions.	Recovery.
	CASE 3. 30 years. One para.	Right. Inguinal. Irreducible. No symptoms of ileus. Fist-sized. Impulse on coughing.	Omentum and tube. Tube showed inflammatory lesions and was adherent to sac.	Resected omentum. Removed tube. Sac was formed by the two layers of the broad ligament.	Recovery.

* Case 6 should appear in Table III as 79b.

TABLE I.—TUBAL HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
8. GAUDIER, Pseudo-étranglement d'une hernie inguinale de la trompe chez une fillette de quatre mois, Bull. and Mém. de la Soc. de Chir., 1906, vol. 32, p. 607.	4 months. Congenital.	Right. Inguinal. Irreducible. Sudden increase in size, associated with pain and abdominal distension. No symptoms of intestinal obstruction. Before onset of acute symptoms swelling was painless and almond-sized.	Tube was constricted by a ring.	Incision of sac. Evacuation of the blood clot. Resection of tube.	Recovery.
9. GLADSTONE, R. J., Obturator Hernia of the Bladder and of the Fallopian Tube, Annals of Surg., 1901, vol. 34, p. 796.	78 years.	Right. Obturator. Reducible. There coexisted a left obturator hernia of the bladder. A reducible crural intestinal hernia existed on right side of pelvis. It did not extend beyond crural canal. Accumulation of fat in pre-vesical region. Increased intra-abdominal pressure consecutive to constriction by a considerably thickened middle valve of Houston.	Middle portion of right Fallopian tube with adjacent meso-salpinx. Sac had escaped from pelvis through obturator canal. It lay imbedded in a mass of fat beneath obturator externus muscle.		Dissecting-room subject. Cause of death certified as morbus cordis.
10. GOEPEL, Ein Beitrag zur Kenntniss der Tubenhernien, Zentr. f. Chir., 1896, vol. 23, p. 829.	62 years. First appeared twelve years ago. Acquired. Primipara.	Right. Femoral. Irreducible. Some symptoms of ileus. Soft, elastic, egg-sized swelling in right groin.	Fallopian tube. Pyosalpinx. Hernial fluid. Sac inflamed.	Removed tube and cystic ovary.	Recovery.
11. IVANOFF, (PÈTRE), Hernie de la trompe de Fallope. Thèse de Lille, 1902.	45 years.	Right. Femoral. Strangulated. Egg-sized swelling. Symptoms of strangulated hernia.	Strangulated tube; loop of intestine. Hernial fluid. Gangrenous gut.	Crural ring was much constricted. Resection of intestine; end-to-end anastomosis. Resection of tube and ovary.	Death.
12. JACOB, J. M., Eingeklemmte Cruralhernie der rechten Tube. Inguinale Koeliotomie mit Extirpation der Tube, Zentr. f. Gynaek., 1904, vol. 28, p. 408.	37 years. Since last two years. Acquired. Eight para.	Right. Femoral. Irreducible. After last delivery felt heavy pain in right inguinal region. Painful at menstruation. Very painful egg-sized swelling below Poupart's ligament. Overlying skin was reddened. Nausea.	Strangulated and cyanotic tube with broad ligament.	Removal of tube. Ligation of broad ligament.	Recovery.
13. KOUSMINE, B. J., Tumeur volumineuse de la région iléo-fémorale gauche constituée par une hernie de la trompe utérine, Rev. de Chir., 1895, vol. 15, p. 313.	36 years. Acquired.	Left. Femoral. Reducible. Fist-sized swelling situated below a line extending from the pubic spine to the anterior superior spine of the ileum. Vaginal and bimanual examination showed that uterus was deviated to the left as well as forward. Painful menstruation.	External half of tube.	Incision. Evacuation of two pounds of clarified purulent fluid. It was a cystic dilatation of the Fallopian tube, forming a hernia in the crural canal. Drainage.	Recovery.
14. LEJARS, Hernie inguinale simultanée de la trompe utérine et de la vessie et les hernies de la trompe, Rev. de Chir., 1893, vol. 13, p. 12, 111.	39 years. Acquired. Recurrence.	Right. Inguinal. Strangulated. Egg-sized oval swelling. Clinical Diagnosis: Inguinal entero-epiplocele.	Fallopian tube and urinary bladder. The ring strangulated the tube.	Removed diseased portion of tube. Bladder was accidentally torn and then sutured; urinary fistula followed. Tube was congested. Lumen of tube was dilated, and on pressure muco-purulent fluid could be made to escape from the pavilion.	Recovery.
15. MAYDL, Ueber retrograde Incarceration der Tube und des Processus vermiformis in Leisten und Schenkelhernien, Wiener Klin. Rundschau, 1895, vol. 9, pp. 17, 33.	47 years. First noticed six years ago after having done some work. Acquired.	Right. Femoral. First reducible; later irreducible. Strangulated. Skin over swelling was reddened. Vomiting.	Fallopian tube; processus vermiformis; blood-stained fluid. Half of the tube was cystic.	Incision. Removed ovary, tube, and appendix. Strangulated portion of tube was within abdominal cavity.	Recovery.
16. MORF, P. F., Hernia of the Fallopian Tube Without Hernia of the Ovary, Annals of Surgery, 1901, vol. 33, p. 247.	24 years. Congenital. One para. Patient had acquired an acute vaginitis, infection extending upward along genital tract into hernial sac; hence pus formation.	Left. Inguinal. Reducible. Since last ten days irreducible. Mass extends into labium majus of left side; has the size and shape of a hen's egg. Overlying skin normal. No impulse on coughing. Muco-purulent vaginal discharge. Clinical diagnosis: Irreducible inguinal hernia.	Fallopian tube and a little thick greenish muco-purulent fluid; omentum in sac.	Removed left tube, left ovary, and portion of omentum. Radical operation for hernia.	Recovery.

TABLE I.—TUBAL HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
17. MORTON, A Case of Hernia of the Fallopian Tube. Lancet, 1894, vol. 1, p. 403.	46 years. Swelling for last two years. Acquired.	Right. Femoral. Tender to touch. Gave the impression of an inflamed gland; softening in the center. Constipation for last five days.	Omentum, Fallopian tube and its fimbriated extremity. Sac much thickened. Small quantity of coffee-colored fluid.	Returned tube and omentum. Sac ligatured and cut away.	Recovery.
18. PICQUÉ and POIRRIER. Étude sur la hernie obturatrice, Revue de Chir., 1892, vol. 12, pp. 342, 348.	78 years.	Left. Obturator. Irreducible. Pain on pressure. Spherical egg-sized tumor at most internal part of Scarpa's triangle. Vomiting. Symptoms of intestinal obstruction. Abdominal distension. Complete uterine prolapse. Clinical diagnosis: Unusual femoral hernia.	At autopsy, the hernial contents: Tube, broad ligament, loop of small intestine, piece of omentum were found bound by old adhesions to sac wall. Hernial fluid. Hernial sac was situated between obturator externus and pectineus muscles.	Incision. Exposure of obturator foramen. Contents outside of adherent omentum apparently reduced by traction made by hand inserted in vagina. Sac was not opened.	Death two months later from recurrence of strangulation.
19. PLANSON, Hernie inguinale de la trompe utérine, seule, Bull. and Mém. de la Soc. Anat. de Paris, 1906, vol. 8, p. 283.	18 years. First seen at age of sixteen. Acquired. One year previously had been operated for left-side inguinal hernia.	Right. Inguinal. Irreducible. Uterus slightly deviated to the right. Walnut-sized body. Painless. Dull on percussion. Impulse on coughing.	On tube were several small cysts. Tube was adherent to hernial sac. Ovary was located slightly above internal ring. Tube presented by its middle portion; uterine and abdominal end of tube were in abdominal cavity.	Removed tube close to uterine horn. Closure of inguinal canal according to typical operation. Division of tubo-ovarian ligament.	Recovery.
20. THOMAS, T., Two Complicated and Unusual Hernias, Brit. Med. Journ., 1896, vol. 2, p. 1203.	36 years. A few days ago. Acquired. A few days. ago while lifting, experienced sudden sharp pain in right groin.	Right. Femoral. Irreducible. Round and tender swelling. No symptoms of strangulation. Femoral hernia of four years' standing was present on left side. On operation, this left-sided hernia was found to contain a large mass of omentum which had escaped through femoral ring.	Swollen and œdematous fimbriated extremity of Fallopian tube. Sac was irregularly pouched and distended with fluid; two ounces of clear serum, and a fibrinous clot.	Reduced tube into abdomen. Radical cure for hernia.	Recovery.
21. WIART, P., Double hernie congénitale des trompes, sans hernie de l'ovaire, Bull. de la Soc. Anat. de Paris, 1898, vol. 12, p. 537.	2½ months. Congenital.	Bilateral. Inguinal. Uterus deviated forward and to the right. There were no other congenital malformations.	Fallopian tubes. Round ligament, Fallopian tube and tubo-ovarian ligament prolapsed through right internal abdominal ring into inguinal canal. The left internal abdominal ring was obliterated by a small portion of the Fallopian tube which moved very freely in inguinal canal. The existence of a peritoneal sac escaping from the external abdominal ring was noticed on both sides. The uterine adnexa were normal.		Dissecting-room subject.
22. WIART, P., Hernie inguinale congénitale de la trompe gauche, Bull. de la Soc. Anat. de Paris, 1899, vol. 1, p. 50.	6 months. Congenital.	Left. Inguinal. Uterus deviated to the left. Hydrocephalic child. No other visceral malformation.	Tube; adherent by a meso to posterior portion of sac.		Dissecting-room subject.
23. WYETH, J. A., Strangulated Hernia of Fallopian Tube, Annals of Surgery, 1894, vol. 19, p. 618.	38 years.	Right. Inguinal. Clinical diagnosis: Right inguinal strangulated hernia.	Swollen, darkly congested Fallopian tube. A loop of small intestine was gangrenous and ruptured, having been caught by an old adhesive band.	Incision. Pus and feces walled up from abdominal cavity through neck of sac. Cleansing of abdominal cavity; creation of artificial anus.	Patient died in six hours. Operated on while patient was in extremis.

TABLE II.—OVARIAN HERNIAS

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
24. AUE, Ein Fall von beiderseitiger angeborener Leistenhernie der Ovarien. Zentr. f. Gyn., 1892, vol. 16, p. 698.	19 years. First noticed at seventh year. Congenital.	Bilateral. Inguinal. Irreducible. Never menstruated. In inguinal region above and external to pubic spine can be seen on both sides an oval swelling size of a hen's egg. Each swelling is hard, movable and tender. Dullness. Ovaries can not be palpated in abdominal cavity. Mammæ and external genitalia under developed. Uterus was not discovered; probably absent.	Right sac contained ovary and pear-shaped cystic degenerated parovarium. Left side showed the same findings.	Radical operation. Parovarium removed. Ovaries reduced into abdominal cavity.	Recovery.
25. BELL, W., Demonstration, Brit. Med. Jour., 1899, vol. 1, p. 1395.	25 years. Appeared suddenly two years ago while lifting a heavy coal-scuttle.	Left. Inguinal. Irreducible. Solid, globular, highly sensitive walnut-sized swelling. Mass was larger and more painful at menstrual period.	Apparently normal ovary. Broad ligament adherent to interior of canal.	Incision. Removed ovary and about two inches of Fallopian tube by transfixing broad ligament, and tying tube and ligament in two sections. Radical cure.	Recovery.
26. BIERMER, R., Zwei Faelle von Ovarialhernien, Zentr. f. Gyn., 1897, vol. 21, p. 233. 2 cases.	CASE 1. 37 years. First noticed fifteen years ago. Four pregnancies.	Right. Inguinal. Irreducible. Swelling extending into right labium majus. Pain during menstrual period. Dull on percussion.	Two cc. hernial fluid. Ovary twice normal size. Ovary contained many cysts.	Ablation of ovary.	Recovery.
	CASE 2. 26 years. First noticed four years ago. Acquired. Nullipara.	Right. Inguinal. Reducible under narcosis. Walnut-sized and almond-shaped. Enlarges during menstrual period. Rectal examination gives small ante-flexed uterus. Left adnexa is palpable; right adnexa not palpable.	Ovary.	Was not operated.	As this case was not subjected to operation we did not consider it in compiling our statisics
27. BOLT, R. A. Ovarian Hernia with a Report of a Case, Surg., Gyn., & Obst., 1908, vol. 6, p. 296.	35 years. First noticed one year ago. Acquired. Five para.	Left. Inguinal. First reducible, became irreducible. Sometimes at menstrual period tumor would be slightly larger and more painful on bimanual palpation. Ovary could not be felt on left side. Impulse on coughing. Painful swelling in left groin, pigeon's egg-sized.	Sclero-cystic ovary and parovarian cyst, size of a small lemon.	Laparotomy. Uterus was seen to be in anteflexion and slightly bent toward the left side. Removed left ovary, tube, and parovarian cyst. Edges of internal inguinal ring were carefully drawn together from within by means of a stitch.	Death three weeks later from bronchopneumonia.
28. BRINDEAU and POTTET, Hernie étranglée de l'ovaire chez un nouveau-né, Bull. de la Soc. d'Obst. de Paris, 1908, vol. 11, p. 17. 2 cases.	CASE 1. 5 months. Congenital.	Small swelling in left groin, partly reducible. Presented all the symptoms of strangulated hernia, minus digestive disturbances and minus the general state of collapse.	Hernia of ovary with torsion of pedicle. Ovary was the seat of a large hæmatoma. Pedicle was twice twisted upon itself.	Dissection and ablation of sac. Ovariotomy.	Recovery.
	CASE 2. (R. Blondel.) 17 years. Acquired.	Side not mentioned. At each menstrual period swelling would enlarge and become painful. The wearing of truss always caused much pain.	Repeated interstitial ovarian hæmorrhages had transformed this organ into a single cavity.	Radical cure.	Recovery.
29. BROWNE, B., Hernia of the Ovary, with a Report of Two Cases Cured by Laparotomy, Transactions of the American Gynecological Society, 1898, vol. 23, p. 352. 2 cases.	CASE 1. 40 years. First noticed twenty years ago. Acquired. Multipara.	Right. Inguinal. Reducible. Larger and more painful at menstrual period. Became strangulated. Fecal vomiting.	Ovary and about twenty inches of dark purplish and almost gangrenous intestine.	Incision over hernial tumor; then laparotomy. Cornu of uterus had been drawn into inguinal canal by prolapsed ovary. Broad ligament formed pedicle of ovary. Removed pedicle, Fallopian tube and ovary.	Recovery.
	CASE 2. 38 years. Appeared since last birth of child. Acquired. Several miscarriages. Three children.	Right. Inguinal. Irreducible. Abdominal muscles thin and relaxed. Lump is tender, becomes larger and more painful at menstrual period. Tumor slightly movable. Uterus anteverted with the cornu inclined to the right side.	Ovary in bottom of sac. Round ligament was thoroughly adherent to sac.	Incised sac. Ovary returned to abdominal cavity. Excision of sac.	Recovery.

TABLE II.—OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
30. CHURCHILL, J. F., Report of a Case of Hernia of the Ovary, Accompanied by Strangulation in a Child Five Months Old., Surg., Gyn. & Obst., 1908, vol. 7, p. 480.	5 months. Congenital.	Left. Inguinal. At first easily reducible; suddenly became irreducible. Hickory nut-sized hard tumor. Vomiting. No bowel movement.	Microscopical examination showed ovary everywhere infiltrated with blood. Medulla cannot be made out and seems to be entirely displaced. Many primitive follicles are seen.	Pedicle and ovary removed. Tube and uterus returned into abdominal cavity. When sac was opened, a firm egg-shaped mass closely resembling splenic tissue in color and consistency came into view.	Recovery.
31. COUSINS, J. W., Ovarian Hernias and the Protrusion of the Appendages Through Rupture of the Vaginal Wall, Brit. Med. Journ., 1895, vol. 2, p. 185.	34 years. Had existed ten years. Acquired. Eight children and three miscarriages.	Right. Inguinal. Pressure excited sickening sensation. Ovoid egg-sized tumor.	Ovary, sac and coverings much thickened, owing to chronic inflammatory changes. On section ovary exhibited a well-marked corpus luteum.	Removed sac and ovary.	Recovery.
31b. CULLEN, THOMAS S. An Extra-Abdominal Multilocular Ovarian Cyst. Journal Am. Med. 1911, vol. 57, p. 1251.	56 years. Acquired. 10 years. Had had eleven children.	Right lobulated swelling 10x8 cm. in right lateral abdominal wall, slightly above a line drawn between the umbilicus and the anterior superior spine. Some pain.	Non-herniated internal genital is normal. Right utero-ovarian ligament passed directly into a hernial opening about 25 cm. diameter.	Laparotomy and incision over extra-abdominal mass. Removal of herniated multilocular cyst.	Recovery.
32. DIEDERICH, Case Report, Annales de la Soc. Belge de Chir., 1900, vol. 8, p. 239.	21 years. Congenital.	Absolute absence of vagina; vulva normal. Labium majora and minora, clitoris, and urinary meatus normal. Hymen intact. Size and type of hernia not stated.	Ovary and rudimentary uterus. Ovary about normal size. Right tube and ovary could not be discovered.	Removed hernial contents. Radical cure of hernia.	Recovery.
33. FARGAS, Note sur un cas de hernie inguino-labiale de l'ovaire droit avec gros kyste réticulaire du même organe, Arch. de Toclogie, 1890, vol. 17, p. 767.	38 years. During the existence of this large tumor patient had had two normal pregnancies.	Bilateral. Right. Inguinal. At first reducible; became irreducible six years ago. Swelling size of a man's head. There co-existed a reducible hernia of the left ovary. During the menstrual periods, the hernial tumors were more sensitive and showed great tendency to remain reduced.	Cystic ovary Some omentum. Extirpated tumor had the volume of a man's head and showed the typical structure of a reticular cyst of the ovary.	Removed tumor, which was free in hernial sac. Ligation of pedicle, including a part of the tube. Separation and ligation of omental adhesions. Ablation of sac and exuberant skin.	Recovery.
34. Goldspohn, A., Case Report, J. A. M. A., 1905, vol. 45, p. 1628.	60 years. Fairly healthy.	Left. Femoral. Irreducible. Small dimensions had not given her much trouble. It became irreducible; then occasioned more or less pain.	Ovary adherent to a small amount of omentum.	Disposition of the adnexa not stated.	Recovery.
35. GUMMERT, Demonstration, Monatschrift f. Geburtshuelfe & Gyn., 1899, vol. 9, p. 548.	After last delivery, there formed a large hæmatoma in right labium majus. Five pregnancies.	Right. Inguinal. Fist-sized sausage-shaped swelling which could be traced to right external abdominal ring. Pain at menstrual period. Overlying skin bluish-red. Moderate fluctuation. No tympany. No fever.	Ovary, fluid and clotted blood.	Removed ovary.	Recovery.
36. HODGE, E. S., Hernia of the Ovary in a Two Months Old Infant, Ann. of Surgery, 1906, vol. 44, p. 958.	2 months. Two weeks before admission lump appeared in right groin. Congenital.	Right. Inguinal. A small umbilical hernia, following infection of cord at birth; but otherwise child was healthy.	Thick hernial sac contained swollen and discolored ovary almost black. No intestine in sac.	Ovary and tube tied off and parts repaired as well as possible.	Recovery.
37. MAYLARD, A. E., Strangulated Hernia of the Left Ovary in the Femoral Region, Brit. Med. Journ., 1892, vol. 1, p. 761.	75 years. First noticed four years ago. Acquired. Unmarried.	Left. Femoral. At first reducible; became irreducible. No constipation. No vomiting. Local pain. Hen's egg-sized mass below Poupart's ligament.	Ovary adherent to sac. In one part of ovary was a cyst, size of a hazelnut.	Removed sac and ovary.	Recovery.
38. MILLER, J. S., Acquired Crural Ovarian Hernia, Med. News, 1892, vol. 60, p. 297.	40 years. Ten years ago, while straining or lifting, she felt something give way and soon noticed a soft tumor in her right groin.	Right. Femoral. Robust. Hard sensitive tumor in region of femoral ring; felt like an inflamed lymphatic gland.	Cystic ovary. Sac thickened. Hernial sac proved to be the broad ligament. Strangulation was so severe that ovary and its pedicle were deeply congested.	Operation. Ovary removed. Radical cure.	Recovery
39. MUMBY, P., Inguinal Hernia Involving the Ovary, Brit. Med. Jour., 1896, vol. 1, p. 17.	About 4 years old. Congenital.	Right. Inguinal. Ovoid swelling extending into labium majus. Intestine reducible. Ovary irreducible.	Intestine and ovary.	Some torsion of ovarian pedicle could be seen; resulting congestion prevented return into abdominal cavity until ring had been enlarged.	Recovery.

TABLE II.—OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
40. NICOLL, J. H., Specimens from a Series of Cases of Hernia of the Ovary in Young Children; Glasgow Med. Journ., 1905, vol. 64, p. 268. 9 cases.				Two were removed because of acute strangulation, apparently due to torsion of pedicle; four because they were cystic; two because they were adherent to wall of sac; one because it occupied an interstitial chamber in the parietes from which it could not be made to pass through the internal ring.	Recovery.
41. NICOLL, J. H., Hernia of the Ovary in Infants with Reference Specially to the Operation of the Affection, Edinburgh Med. Journ., 1908, vol. 66, p. 203.	2—1½ months. 10—2 months. 7—3 months. 5—4 months. 6—5 months. 3—6 months. 3—7 months.	Inguinal. 34 unilateral. 2 bilateral.		Seven Oophorectomies. Ovary reduced eighteen times. Cyst ablated and ovary reduced eleven times. After contents had been dealt with, the sac was ablated and the inguinal canal closed by one or the other methods. Radical cure of inguinal hernia.	Has operated on sixty-two cases without a death.
42. PARSCHE, T. W., Prolapsus Ovarii in the Femoral Ring, Simulating a Strangulated Femoral Hernia, International Journal of Surgery, 1906, vol. 19, p. 290.	43 years. Has existed fourteen years. Two para.	Right. Femoral. Irreducible. Size of two fists. Developed symptoms of ileus.	Ovary. Tumor mass 6 x 4 cm. consisting of three large cysts, containing a thin, bloody odorless fluid; it was a multilocular ovarian cyst.	Herniotomy. Removed hernial contents.	Recovery.
43. QUADFLIEG, Zur Kasuistik der Hernia Ovarica Inguinalis, Muenchener Medizinische Wochenschrift, 1901, vol. 48, p. 790.	3½ months. Congenital.	Painful swelling in left inguinal region. Some vomiting.	At operation, there was found a gangrenous ovary everywhere adherent to hernial sac. This gangrene was due to torsion of pedicle.	Removed ovary.	Recovery.
44. ROSE, Eine Art Orthepædie der Ovarien, Deutsche Zeitschr. f. Chir., 1901–1902, vol. 62, p. 325.	Unmarried. Patient had never noticed swelling.	Left. Inguinal. Irreducible. Swelling in left external abdominal ring; tender.	Ovary.	Incision. Exposed mass. External opening was occupied by ovary, about half normal size. Organ was freed from all adhesions, reduced into abdominal cavity, as it showed no pathological changes. Radical cure for hernia.	Recovery.
45. SÉBIAN, H., Les hernies de la trompe et de l'ovaire. Thèse de Paris, 1904.	35 years. Followed a fall ten years ago. Acquired.	Left. Inguinal. Irreducible. Very slight impulse on coughing. Clinical diagnosis: Epiplocele.	Thickened sac. Ovary apparently healthy, though enlarged.	Reduced ovary into abdominal cavity. Radical cure.	Recovery.
46. SEELIGMANN, Demonstration eines Falles von Oophorocele in einer linksseitigen inguinal Hernia, Zentr. f. Gyn., 1896, vol. 20, p. 101, p. 434. 2 cases.	CASE 1. 33 years. Five years ago. Acquired. Two pregnancies.	Left. Inguinal. Fist-sized swelling. Uterus and adnexa displaced to left side. Hernial bandage caused severe pain. Left ovary could not be felt in pelvis.	Ovary and adherent intestine.	Reduced adherent intestine into abdominal cavity. Removed cystic ovary and hernial sac. Radical operation.	Recovery
	CASE 2.	Right.	Cystic ovary in hernial sac.		
47. SEYMOUR, G., Hernia of a Sarcomatous Ovary, Med. News, 1897, vol. 70, p. 241.	48 years. First noticed two years ago. Acquired. Multipara.	Right. Inguinal. Reducible; later irreducible. No vomiting. No constipation.	Mass on microscopical examination proved to be a spindle-cell sarcoma of the ovary.	Sac incised. Mass found attached to a large pedicle or ligament four inches long, extending from the uterus within pelvic cavity through internal ring to under side and upper end of tumor as it lay in inguinal canal. Pedicle tied. Mass removed.	Recovery.
48. STOUFFS. Hernie eines eitrigen Ovariums bei einer Frau von 68 Jahren, Zentr. f. Gynaek., 1897, vol. 21, p. 929.	68 years. Acquired.	Right. Inguinal. Irreducible. Walnut-sized. No ileus. Painful. Clinical diagnosis: Epiplocele.	Ovary showed areas of suppuration.	Removed ovary. Ligated pedicle.	Recovery.

TABLE II.—OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
49. TURGIS, Hernie de l'ovaire, Bull. and Mém. de la Soc. de Chir., 1893, vol. 19, p. 79.	40 years. Acquired. Nullipara.	Right. Inguinal. Irreducible. Immobile. Ovoid. Egg-sized. Swelling above fold of groin. Dull on percussion. Region is red, tumefied and hot.	Ovary.	Abscess incised; free escape of pus. There was a bloody discharge from this opening at each menstrual period. This continued for eighteen months. In the intermenstrual periods there was not any discharge from fistulous openings.	Recovery.
50. WAHL, Demonstration, Monatschrift f. Geburtshuelfe & Gyn., 1901, vol. 13, p. 643.	34 years. First noticed twenty years ago. Acquired.	Left. Irreducible. Swelling could be kept well reduced by wearing a truss; suddenly became irreducible. Painful. Swelling was above Poupart's ligament. Goose egg-sized, round, and hard. Clinical diagnosis: Strangulated hernia.	Cystic ovary.	Incision of sac. Ligation of pedicle. Removed mass.	Recovery.
51. WAY, E. W., A Case of Inguinal Ovarian Hernia, The Australasian Med. Gaz., 1893, vol. 12, p. 191.	37 years. First noticed eleven years ago. Acquired.	Right. Inguinal. Irreducible. Severe pain in right groin. Locomotion difficult. Wearing of truss occasioned pain.		Removed mass; it showed the elements of a fibromyoma of the ovary. In the mass was a remarkable development of fine nerve-filaments. Ovary removed. Radical operation for hernia.	Recovery.
52. ZINNIS, A., Hernie congénitale de l'ovaire, Rev. Médico-Chirurgicale des Maladies des Femmes, 1894, vol. 16 p. 364.	21 months. Congenital.	Right. Inguinal. Reducible. Hazelnut-sized swelling; extending into right labium majus. Painless. Movable. Gurgling sound when reduced. Slight intestinal catarrh.	Ovary.	Was not operated.	Child died of pulmonary congestion. Autopsy confirmed diagnosis.

TABLE III.—TUBO-OVARIAN HERNIAS

54. BELBIN, H. A., A Case of Hernia of the Ovary in a Child Seven Months Old, Brit. Med. Journ., 1898, vol. 1, p. 1389.	7 months.	Left. Inguinal. Irreducible. Tense non-translucent swelling extending from internal abdominal ring to labium majus. No impulse on coughing. Clinical diagnosis: Strangulated inguinal hernia.	Fimbriated end of Fallopian tube and ovary; both were black and swollen. Blood-stained fluid. There was no tightness or constriction of the pedicle at internal ring. The congestion was due to the double kinking of the pedicle.	Pedicle ligated. Mass removed. Sac and canal treated as for radical cure.	Recovery.
55. BIRNBAUM, R., Beitrag zur Kenntniss der Hernia Uteri Inguinalis und der histologischen Veränderungen verlagerter Ovarien, Berlin. klin. Wochenschrift, 1905, vol. 42, p. 632.	35 years. First noticed at age of five years.	Left. Inguinal. Irreducible. Walnut-sized tumor which could be moved from inguinal ring downward into labium. Had never menstruated. Pelvic organs were of infantile type. Could not wear a truss, on account of local tenderness.	Ovary imperfect. Tube and solid rudimentary uterus. Fallopian tube had no fimbriated extremity. Uterus had no cavity. Right ovary, tube, and round ligament were absent.	Removed hernial contents. Radical hernia operation.	Recovery.
56. BLACK, C. E., Hernia of the Ovary, Appendix, and Meckel's Diverticulum with Abscess, Ill. Med. Journ., 1904, vol. 5, p. 523.	40 years. Six-para. The disorganization of the diverticulum and intestinal wall was caused by the contact of the abscess secondary to the rupture of the appendix.	Right. Inguinal. Reducible; became suddenly irreducible. Has been subject to attacks of pain in right inguinal region, accompanied by appearance of small tumor. No constipation. Extreme sensitiveness over tumor. Clinical diagnosis: Irreducible epiplocele.	Fallopian tube and ovary. Meckel's diverticulum about 3½ inches long; appendix with abscess; six inches of gut. Some offensive pus. Presence of pus was due to the ruptured appendix.	Incision. Pus escaped. Gut resected and united with Murphy button. All other hernial contents removed. Drainage.	Recovery.
57. BLOODGOOD, J. S., Johns Hopkins Hospital Report, 1898–99, vol. 7, p. 318. 2 cases.	CASE 1. 45 years. Five years' duration. Acquired.	Right. Inguinal. Reducible. Incomplete. Indirect. Wearing of truss was so painful that it had to be discontinued.	Ovary and tube. No adhesions between sac and contents.	Returned tube and ovary into abdominal cavity.	Recovery.
	CASE 2. 38 years. Was noticed for ten years. Acquired.	Left. Inguinal. Reducible. Incomplete. Pain and discomfort caused by the truss. Small inguinal hernia existed on opposite side.	Tube and ovary. Tube was adherent by a narrow band, which was divided.	Reduced tube and ovary.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
58. BORDEAU, M., De la hernie complète des organes génitaux profonds de la femme en dehors de la grossesse, Thèse de Paris, 1905.	35 years. Congenital. Multipara.	Right. Inguinal Irreducible. Tense and painful hen's egg-sized swelling. No symptoms of ileus. Clinical diagnosis: Strangulated hernia.	Tubes, ovaries, and uterus. Bilateral pyosalpinx	Hernio-laparotomy. Uterus reduced. Bilateral salpingectomy.	Recovery.
59. BOULFROY, D., Hernie inguinal gauche; des hernies des organes génitaux de la femme, Thèse de Lyon, 1904.	57 years. Nun.	Left. Inguinal. Strangulated. Mandarine-sized swelling extending into labium majus. About ten years ago was operated for radical cure of left inguinal hernia. Six months after, following paroxysms of cough, hernia reappeared. Orange-sized swelling. Uterine prolapse.	Tube. Cystic ovary. These organs were extrasaccular. There was present a hernial sac containing a loop of small intestine.	Resected tube and ovary. Radical cure for hernia.	Recovery.
60. BRISTOW, A. T., A Case of Strangulated Hernia of the Ovary and Fallopian Tube, Medical News, 1902, vol. 81, p. 61.	44 years. Acquired. While lifting a heavy weight, felt a sudden pain in inguinal region. Six pregnancies.	Left. Inguinal. Irreducible. Hard to touch. Dull on percussion. Impulse on coughing. Skin slightly reddened. Painful. Uterus was well over to left side.	Tube and ovary, and round ligament. Abscess in tube. Cystic ovary. Stump of round ligament was fixed in inguinal canal.	Sac and contents removed without opening abdominal cavity.	Recovery.
61. BROCA, Bull. de la Soc. Anatomique de Paris, 1893, vol. 7, p. 86.	4 years. Following a coughing spell, child complained of a swelling and pain in left inguinal region.	Bilateral. Right inguinal at age of eight months.	In right-sided hernia ovary and tube. Left-sided hernia contained ovary and tube.	These organs being healthy they were reduced into abdominal cavity. Excision of sac. Radical cure.	Recovery.
62. BROESE, Hernia Ovarica Inguinalis, Zentr. f. Gynaek., 1906, vol. 30, p. 1097.	32 years. Congenital.	Inguinal. Irreducible. No pain.	A part of ovary and three cm. of abdominal extremity of tube. Sac did not communicate with peritoneal cavity.	Removed herniated parts of ovary and tube without opening abdominal cavity.	Result not stated.
63. BROHL, Eine Hernia Uteri bei Pseudohermaphroditismus femininus, Deutsche med. Wochenschrift, 1894, p. 338.	36 years. First noticed swelling seven years ago.	Left. Irreducible. Menses began at eighteen years of age. Well-developed nonperforated penis. Had a vagina with an undamaged hymen. Labia minora poorly developed; labia majora well developed. Swelling enlarged at each menstrual period. No prostate. No seminal vesicles. No testicles.	Uterus, ovaries, and tube. Some serous fluid.	Removed a well-developed left and a rudimentary right ovary surrounded by broad ligament, much dilated tube and a bicornuate uterus.	Recovery.
64. BUCURA, Ovarialhernien, Zentr. f. Gynaekologie, 1904, vol. 28, p. 1410.	34 years. Of one year's duration. Discovered at operation table. Acquired. One year previously had removed by laparotomy left ovary for a cystoma.	Right. Inguinal. No pain. Uterus deviated to the right.	Atrophied ovary; distal two thirds of right tube, and small intestine. Round ligament and tube lost in hernial sac. A pouch of peritoneum adherent to hernial sac contained a bladder diverticulum.	Laparotomized and drew back hernial contents into abdomen. Hernial sac removed. Radical cure for hernia.	Recovery.
65. BULLITT, J. B., Ovarian Hernia with Congenital Absence of Vagina, Louisville Monthly Journal of Med. and Surg., 1904, 1905, vol. 11, p. 97.	Congenital. First noticed hernia six years ago on right side; since that time, similar condition has developed on the other side.	Bilateral. Inguinal. Menstruation has never occurred. Absence of vagina. Right hernia size of a hen's egg.	Right hernial sac contained ovary enlarged to three times its normal size and tube. Left hernial sac contained ovary and tube. Left ovary was smaller than normal.	Operation. Right ovary and tube removed. Left ovary and tube returned to abdominal cavity. Radical cure on both sides.	Recovery.
66. CAHEN, F., Case Report, Muenchener Med. Wochenschrift, 1900, vol. 47, p. 1325.	2 months. Congenital.	Right. Inguinal. Plum-sized and hard swelling extending to the middle of labium majus No constipation. Vomiting.	Tube and ovary, the pedicle of which was twisted 180 degrees around its axis. Ovary contained numerous large and small cysts. Dark-colored hernial fluid.	Removed ovary and tube. Partial removal of hernial sac. Radical cure for hernia.	Recovery.
67. CAMPBELL, R., Strangulation of Uterine Appendages in Inguinal Hernia, Brit. Med. Journ., 1905, vol. 2, p. 1206.	Three cases occurring in infants. Congenital.	Inguinal.		Strangulation was the result of twisting of broad ligaments and not of constriction by neck of the sac or by the abdominal wall. Ovary was enlarged and cystic in all cases; in one, the uterus and bladder occupied upper part of sac.	Results not stated.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
68. CARDOT. Bull. and Mém. de la Soc. de Chir. de Paris, 1906, vol. 32, p. 1125.	Ten months.	Left. Inguinal. Irreducible. Hard and tender almond-sized swelling. No discoloration of skin.	A bluish mass consisting of ovary and tube.	Excision of mass.	Recovery.
69. CARSTENS, J. H., J. A. M. A., 1906, vol. 47, p. 1713.	16 years. Had existed for some time.	Left. Inguinal. Grew larger and was painful during menstrual period. Clinical diagnosis: Hydrocele of the cord.	Ovary, tube, and hernial fluid.	Incision. Escape of some hernial fluid. Sac closed.	Recovery.
70. CARSTENS, J. H., Ovary and Tube and Ovarian Tumors in the Inguinal Canal, J. A. M. A., 1907, vol. 49, p. 1512. 2 cases.	CASE 1. 22 years. First noticed tumor at age of twelve years.	Left. Inguinal. Painful, fluctuating tumor. Clinical diagnosis: Hydrocele of the round ligament.	Adherent ovary and Fallopian tube in canal.	Removed ovary and tube close to the internal ring.	Recovery.
	CASE 2. 30 years. Had had children.	Right. Inguinal. Reducible. No menstrual disturbances. Was not able to wear a truss.	Tube, remnant of ovary. Six pounds of white liquid in sac.	Laparotomy. Removed tube and remnent of ovary. Tied pedicle and removed growth.	Recovery
71. CHARON, Hernie inguinale gauche de l'ovaire et de la trompe chez une enfant de trois mois, Journ. de Clinique et de Thérapeutique infantiles, 1898.	3 months. Bottle-fed child.	Left. Inguinal. Walnut-sized swelling. Irreducible.	Ovary and tube.	Reduced ovary and tube in abdomen. Radical cure for hernia.	Recovery.
72. CHÉNIEUX, Hernie de l'ovaire. Ablation. Guérisen., Bull. and Mém. de la Soc. de Chir. de Paris, 1890, vol. 16, p. 306.	40 years. Multipara. The author was unable to determine whether the hernia was acquired or congenital.	Right. Ischiadic. Voluminous tumor in right gluteal region. Volume of tumor was the source of complaint.	Degenerated cystic right ovary and tube.	Removed ovary and tube. Uterine horn was seen. Pedicle sutured with care to the parietal peritoneum of the small pelvis.	Recovery.
73. CULLEN, T. S., KELLY'S Operative Gynecology, vol. 2, p. 603.	8 years.	Left. Inguinal.		On opening sac, both ovary and tube were found adherent and the attempt to return them to the abdomen proved futile. Both were tied off and removed with the adherent portion of the sac.	Recovery.
73*a*. CULLEN, T. S., A Right Pelvic Kidney. Absence of the Left Kidney, Absence of the Uterus; Both Ovaries in the inguinal canals. Surg. Gyn. & Obst., 1910, Vol. XI, p. 73.	17 years. 5 years ago left hernia appeared. 3 years later hernia made its appearance on right side.	Bilateral Inguinal Patient had never menstruated. No evidence of vagina.	In right hernia sac, was found right ovary and all of right tube except fimbriated end. Right kidney filled right half of pelvis.	Laparotomy	Condition same as when she entered hospital
74. CULLEN, T. S., The Right Ovary in the Abdominal Scar Following an Operation for Appendix Abscess, Johns Hopkins Hospital Bull., 1906, vol. 17, p. 152.	About ten years ago, operated on for an appendicial abscess for which it was necessary to provide free drainage.	In appendical scar, tender bulging.	Mass consists of a tube and ovary. Ovary is covered everywhere with adhesions, is large and cystic and lay directly beneath skin.	Resection of old scar Removed ovary and tube; former contained partially organized corpus luteum.	Recovery.
74*a*. CRANWELL, DAN, J. Les hernies inguinales de l'utérus, Revue de Gynécologie et de chir. abd., 1908, vol. 12, p. 777.	43 years. About seven months' standing.	Right. Inguinal. Strangulated. Fist-sized. Had never menstruated.	Uterus. No cervical external os. Adnexa exist only on one side; one tube, one ovary. Blood-stained fluid.	Removal of contents of sac. Operation for radical cure.	Recovery.
75. DAMIANOS, N., Ueber die Stieldrehung der Adnexa in Leistenbruechen im fruehen Kindesalter, Deutsche Zeitschr. f. Chir., 1905, vol. 80, p. 228.	14 months. First noticed at third month. Congenital.	Left. Inguinal. Reducible. Fourteen days before admission to hospital tumor became irreducible. Swelling size of pigeon egg. Dull on percussion. Child poorly nourished.	Ovary, tube and broad ligament. Reddish brownish fluid. Ovary showed gangrenous foci. Ovary was the size of a filbert-nut and kidney-shaped. It was dark violet. Torsion of pedicle.	Removed tube, ovary, and hernial sac. Drainage.	Recovery.
76. DEFONTAINE, Hernie inguinale de l'utérus et de deux ovaires chez une fillette de sept mois, Arch. Prov. de Chir., 1895.	7 months. Congenital.	Left. Inguinal. Irreducible. Pyriform swelling extending into left labium majus.	Entire utero-ovarian apparatus. Hernial fluid.	Internal abdominal ring divulsed. Uterus and adnexa returned into abdominal cavity.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
77. DELAY, Extirpation de deux ovaires ectopiés et d'un kyste ovarien par la voie inguinale; absence de vagin; présence de tissu utérin à la région inguinale, Lyon Méd., 1904, vol. 102, p. 105.	28 years. Tumor had existed ever since patient can remember. Congenital.	Bilateral. Inguinal. Strangulated. External genitalia normal. Vagina absent; in its place existed a small infundibulum barely admitting the tip of the finger. Rectal examination did not reveal presence of uterus. Had never menstruated. Movable, walnut-sized, swelling in both inguinal regions. Clinical diagnosis: Strangulated inguinal hernia.	Microscopical examination of the removed tissues showed the presence of uterine tissue and also elements of the Fallopian tube. The ovaries showed lenticular cysts. A portion of the uterine cornu had been removed.	Bilateral operation as for inguinal hernia; removed an ovarian cyst on one side. Removed ovary on other side. See preceding columns.	Recovery.
78. DE NAZARIS, Hernie inguinale de l'ovaire droit, Rev. Méd. Chir. des maladies des femmes, 1895, vol. 17, p. 541.	Not stated.	Right. Inguinal. Reducible. Following a violent coughing spell, a small tumor appeared at level of external abdominal ring. Egg-sized swelling, slightly tender on pressure. It is periodically the seat of pain and has occasioned digestive disturbances.	Ovary, tube and about two hundred grams of yellowish fluid. Ovary and tube adherent at level of external abdominal ring.	Isolation and removal of sac. Unilateral castration. Incision. Radical cure.	Recovery.
79. DE SNOO, Zentr. f. Gynaek., 1907, vol. 31, p. 1446. Case 6 from Table I should be noted as 79b	13 years. Congenital.	Left. Rectal examination showed uterus of normal dimensions.	Ovary, seat of cystic degeneration. Closed tube normal in appearance and a loop of intestine easily reducible. Left broad, round and ovarian ligaments. Atresia of tube was secondary to mechanical causes.	Removed ovary and tube.	Recovery.
80. GANGELE, K., Ueber Ovarialhernien mit Stieltorsion, Deutsche Zeitschr. f. Chir., 1904, vol. 73, p. 216.	8 months. Congenital.	Left. Inguinal. At first reducible; became irreducible. Egg-sized tender swelling in left inguinal region. Child in good condition; no symptoms of intestinal obstruction.	Torsion of pedicle. Ovary enlarged sixfold and abdominal end of tube. Microscopically, areas of complete necrosis in tube and ovary.	Radical operation. Removed ovary and abdominal end of tube; both organs gangrenous.	Recovery.
81. GRUNERT, Ueber Herniotomien im Kindesalter, Deutsche Zeitschr. f. Chir., 1903, vol. 68, p. 518.	5½ months. Congenital.	Left. Inguinal. Strangulated. Walnut-sized swelling of left labium. No vomiting. No constipation.	Tube and ovary. Left cornu of uterus was protruding through inguinal internal ring. Pedicle was thrice twisted on its axis. Ovary and tube showed swelling and beginning gangrene.	Removed left ovary and tube.	Recovery.
82. GUINARD & DUDEFOY. Hernie inguinale gauche de la trompe. Salpingite correspondante. Kélotomie. Ablation de la trompe malade et de l'ovaire. Bull. de la Soc. Anat., 1893, vol. 7, p. 85.	24 years. After delivery, four years ago, first noticed hernia. Acquired. Painful and instrumental delivery.	Left. Inguinal. Robust. First menses at 16 years. Dysmenorrhea. Profuse flow of 8 days duration. Swelling in inguinal region painful on pressure; lately pain has become constant, tumor has increased in volume. Vaginal sero-purulent discharge. Two swellings can be palpated in inguinal canal. Impulse on coughing.	Tube is sausage-shaped and contains three abscesses separated from each other. Tube seat of parenchymatous salpingitis. Ovary is enlarged.	Removed tube and ovary.	Recovery.
83. HABS, Demonstration, Muenchener Med. Wochenschrift, 1901' vol. 48, p. 123.	5 months. Congenital.	Left. Inguinal.	Tube and ovary. Anterior layer of broad ligament entered into formation of anterior wall of hernial sac. Left uterine horn presented at hernial ring. Pedicle thrice twisted upon its axis. Both organs cyanotic and in beginning state of gangrene.	Herniotomy followed by Bassini's operation. Removed hernial contents.	Recovery.
84. HEIBERG & HOWITZ, Demonstration, Arch.f.Klin.Chir., 1904 1905, vol. 75, p. 487.	6 months. Congenital.	Right. Inguinal. Irreducible. Robust child. Goose egg-sized body. Dullness on percussion. Umbilical ring is patulous. Examination per rectum showed that fundus of uterus was deviated towards right inguinal region; fundus moved when traction was made on hernial swelling.	Ovary. Fimbria of tube. Part of broad ligament which connects tube to ovary. Blackish hernial fluid. Torsion of pedicle.	Herniotomy. Ligation of pedicle. Excision of of sac, ovary, and of abdominal end of tube and corresponding portion of broad ligament.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
	CASE 1. 15 years of age. Congenital. Operating-table discovery.	Left. Inguinal. Irreducible. Walnut-sized tumor. Painless. No other malformation. Patient at time of operation was suffering from an attack of acute appendicitis. We availed ourselves of the general anæsthesia induced for the appendectomy to operate on the hernia.	Tube and ovary. Tube adherent to hernial sac; otherwise normal.	Appendectomy on right side. On left side, herniotomy. Separated adhesions; returned hernial contents into abdominal cavity. Operation for radical cure.	Recovery.
85. AIMÉ PAUL HEINECK. 3 Cases.	CASE 2. 12 years. First appeared four years ago, following heavy lifting. Acquired. Grandfather, grandmother, grand-uncle and two uncles on paternal side had inguinal hernias. One cousin has hernia and ectopic testis.	Bilateral. Inguinal. Incomplete. Reducible with difficulty. Wearing of truss caused pain. No other malformation.	Each sac contained the tube and ovary of the corresponding side. Organs were normal. Sac intimately adherent to round ligament.	Organs reduced. Operation for radical cure (BASSINI). During the course of operation. Deep epigastric vessel on left side was accidentally punctured; it was ligated.	Recovery.
	CASE 3. 60 years of age. Patient has had a swelling in groin as long as she remembers. Father and brother each had an inguinal hernia. 5-para.	Right. Inguinal. Irreducible, very fleshy individual. Fist-sized swelling. On urination swelling decreased in size. Bulk of swelling was below a line extending from anterior superior spine of ilium to pubic spine. Clinical diagnosis: Femoral hernia of urinary bladder.	Ovary and about 3 cm. of distal end of tube, portion of urinary bladder. Ovary was sclerotic.	Upon incision pedicle of sac was seen to extend into inguinal canal. Unilateral castration. Return of urinary bladder to abdominal cavity. Operation for radical cure (BASSINI).	Recovery.
86. HERMANNS, Ueber Brucheinklemmung von Adnexen im fruehen Kindesalter, Deutsche Zeitschr. f. Chir., 1905, vol. 80, p. 248.	3½ months	Right. Inguinal. Robust. Hard swelling of right groin. No constipation. Vomited once. Clinical diagnosis: Incarcerated inguinal hernia.	Almond-sized bluish-black ovary and congested tube. Bloody fluid.	Herniotomy. Enlargement of hernial ring by operator. Removal of adnexa.	Recovery.
87. HILGENREINER, H., Beitrag zur Kenntniss der Hernia uteri inguinalis, Berlin. Klin. Wochenschr., 1906, vol. 43, p. 319.	53 years. Nullipara.	On account of symptoms of strangulation; operated in 1893 for right inguinal hernia sac at that time contained gut, uterus, and right adnexa. These were reduced and hernial sac was closed. In 1901 recurrence of symptoms of strangulation. Tumor size of two fists in right inguinal region; irreducible; tympanitic note.	Congested and distented cæcum. Appendix 8 cm. long and healthy. Right tube and ovary. Uterus adherent to sac.	Everything reduced into abdominal cavity. Drainage.	Recovery.
88. HEEGARD, HJALMAR, Ueber Ovarialhernien, Arch. f. Klin. Chir., 1904–1905, vol. 75 pp. 424, 487.	4 weeks. Congenital.	Inguinal. Left. Elastic, tender swelling. No increase in size on crying. Dull percussion note. Later in site of operation wound a new oval almond-sized movable tumor appeared, tender, not reducible. No ileus. Some vomiting. No constipation. Clinical diagnosis: Adenitis inguinalis suppurativa.	Cyanotic ovary and tube. Serous fluid in sac. Ovarian stroma infiltrated with red and white blood corpuscles. Pedicle twisted.	Incision. Ablation of ovary and tube. New tumor contained right ovary and tube; they were returned into abdominal cavity.	Recovery.
89. JOPSON, Hernia of the Uterus through the Inguinal Canal, Annals of Surgery, 1904, vol. 40, p. 98.	27 years. Congenital. Colored. Three-para.	Right. Inguinal. Irreducible. Menstruation normal. A week ago protrusion suddenly increased in size; is now fist-sized. No symptoms of obstruction. Severe pain. Clinical diagnosis: Probable omental hernia.	¾ of an ounce of yellow odorless pus; ovary, broad ligament, tube, uterus, and part of left tube. Uterus was strangulated, partly necrosed; during manipulation it was torn and pus contained in cavity escaped.	Sac opened. Removed body of the uterus, right ovary, both tubes and supravaginal portion of uterus. Left ovary was not removed. Pedicle fastened in external abdominal ring.	Recovery.
90. JORDAN, M., Tubargravidaet in einer Leistenhernie, Muench. Med. Wochenschr. 1897, vol. 44, p. 7.	37 years. Two-para.	Left. Inguinal. Irreducible. Apple-sized. Painful. After first delivery pyosalpinx ruptured into broad ligament. After second delivery vesical-vaginal fistula. Seven weeks after last menstruation which was scant, abdominal pain, vomiting, symptoms of internal hæmorrhage. There co-existed a right inguinal hernia.	Part of Fallopian tube, ovary, clotted blood. Eleven to twelve weeks old fœtus. Ovum laid among loops of gut at bottom of hernial sac; colon was adherent to hernial sac. Ovum had developed in middle portion of tube.	Operation two days after first appearance of ileus. Opened hernial sac. Removed fœtus. Resected ovary and fringe of omentum. Reduced intestine. Resected a portion of tube.	Death.*

* At the autopsy it was seen that right hernial sac contained an adherent loop of small intestine, omentum and a loop of transverse colon. Multiple stenosis of intestines, due to numerous adhesions, chronic interstitial nephritis, right hydro-nephrosis.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
91. KENNEDY, F. W., Strangulation of Hernia of the Ovary, Brit. Med. Journ., 1909, vol. 2, p. 1407.	4 months.	Left. Inguinal. Always well until two days before operation. On that day mother noticed a swelling in left groin rapidly increasing in size, tender. Child cried a good deal. No vomiting. Extended into left labium.	Ovary and part of tube were engorged with blood and swollen to about the size of an adult organ.	Removed ovary and part of tube. Ligated pedicle with catgut.	Recovery.
92. KIVLIN, C. F., Hernia of Tube and Ovary Complicated by Strangulation of Intestine, New York Med. Journ., 1908, vol. 88, p. 404.	30 years. Acquired. Four children. One stillbirth.	Right. Direct. Inguinal. Walnut-sized tumor just to the upper and outer side of labium majus. Symptoms of intestinal obstruction.	Yellowish-black fluid. Right tube and ovary, intestine and omentum. Strangulation of small bowel. Bowel had been caught and held firmly by external ring. Ovary was sclerotic and tube was congested, due to constriction.	Sac opened. External ring divided. Tube, ovary, and intestine returned to abdomen. Ligated omentum present in hernial sac.	Recovery.
93. KRUG, F., Congenital Inguinal Hernia of Uterus, Left Tube and Ovary, American Journal of Obst., 1890, vol. 23, p. 606.	18 years. Congenital.	Left. Inguinal. Menstruation began at 16, scant. Swelling consists of two hard, movable, palpable masses; one is pear-shaped, the other is walnut-sized. The larger mass can be returned from the hernial sac into abdominal cavity. Smaller mass is irreducible. On bimanual examination the pear-shaped mass is found to be a uterus.	Tube and ovary were firmly adherent to sac. Uterus.	Free incision over swelling. Sac, tube, and ovary removed. Uterus returned to abdominal cavity.	Aseptic healing of wound; died suddenly 15 days after operation. Cause of death undetermined.
94. LAMBRET, Hernie inguinale de la trompe et de l'ovaire, La Gynécologie, 1905, vol. 10, p. 257.	22 years. First appeared at age of ten years.	Left. Inguinal. Egg-sized tumor partly reducible.	Ovary slightly atrophied and tube adherent to sac.	Removed ovary and tube.	Recovery.
95. LARIMORE, F. C., Hernia of the Ovary and Tube and the Vermiform Appendix, Med. Record, 1900, vol. 58, p. 192.	35 years. Had had trouble since childhood.	Left. Oblique. Inguinal. Irreducible. Orange-sized.	Ovary, tube, and appendix. Tube was as thick as little finger and four inches long.	Appendectomy. Ovary and tube transfixed; excision of sac. Radical cure for hernia. Ovary and appendix firmly bound down by adhesions	Recovery.
96. LAUNAY & WIART, Deux cas d'hernie inguinale congénitale de l'ovaire et de la trompe, Bull. de la Soc. Anatomique de Paris, 1897, vol. 11, p. 78–82. 2 cases.	CASE a. 2 months. Congenital.	Right. Inguinal. Reducible. Uterus deviated toward the abdominal orifice of right inguinal canal. There were no other malformations of the genital organs.	Ovary and tube. Hernial sac was accompanied posteriorly and internally by the fibers of the round ligament.		Dissecting-room subject.
	CASE b. 33 years.	Left. Inguinal. Irreducible. The wearing of a truss caused discomfort. Oval swelling in left groin; painful and enlarged at menstrual periods. Dullness on percussion.	Hernial sac lies upon anterior surface of external oblique and extends obliquely upward and outward from the external abdominal ring toward anterior superior spine of the ilium. Contained a quantity of fluid, tube, and ovary. Tube adherent to sac. Ovary not adherent.	Separation of tubal adhesions. Tube and ovary reduced into abdominal cavity. Excision of sac.	Recovery.
97. LEGRAIN & ASCHOFF, Contribution à l'étude de la hernie inguinale des organes génitaux, Annales des maladies des organes génito-urinaires, 1902, vol. 20, p. 1569.	4 months.	Left. Inguinal. Reducible. Became irreducible. Every time hernia was reduced child cried. The swelling occupied the whole left labium. Tenderness. Vomiting. No constipation.	A tablespoonful of odorless wine-colored fluid. Ovary and tube. These organs are engorged with blood and on the verge of gangrene.	Ovariotomy. Removed part of Fallopian tube.	Recovery.
98. LEGUEU, Hernie inguinale congénitale de l'utérus et des annexes, Revue de Gynécologie, 1908, vol. 12, p. 726.	26 years. Congenital.	Left. Inguinal. Periodical radiating pain in abdomen. Patient had never menstruated. No impulse on coughing. Vaginal imperforation.	Infantile uterus. Two tubes, one ovary, and two broad ligaments.	Organs resected. Hernia was operated according to rule.	Recovery.
99. LEGUEU, Hernie inguinale gauche congénitale de l'utérus et des annexes des deux côtés Imperforation du vagin. Bull. de la Soc. Anat., 1897, p. 303.	18 years. Congenital.	Left Inguinal. Partly irreducible. Irregular swelling. Normal vulva. Had never menstruated.	One ovary, uterus, and two tubes.	Returned organs to abdominal cavity.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
100. LE NOUÈNE, Contribution à l'étude des hernies des organes génitaux de la femme dans le canal inguinale, Gazette de Gynécologie, 1903, vol. 18, p. 337. 2 cases.	CASE 1. 39 years. Ten years ago. Acquired.	Right. Inguinal. Reducible. Walnut-sized painful swelling and enlarged during menstrual period. Movable in canal. Vaginal examination negative.	Ovary and tube. No adhesions.	Organs reduced. Radical cure.	Recovery.
	CASE 2. 35 years. Congenital. No children. No miscarriages.	Right. Inguinal. Irreducible. Hen's egg-sized tumor. Painful. Dull on percussion. No symptoms of ileus.	Uterus and suppurating adnexa on both sides. There were lesions of suppurative salpingitis.	Both tubes removed. Uterus returned to abdominal cavity.	Recovery.
101. LICKLEY, J. D., Case of Obturator Hernia of the Ovary, Glasgow Med. Journ., 1902, vol. 57, p. 179.	87 years.	Right. Reducible. Obturator. Body of uterus had been deflected to the right side and cervix was lying to the left. Condition had not been recognized during life. There was also a distinct small hernial sac in left crural canal.	Ovary. 1 cm. of right ovarian ligament. 4.8 cm. of Fallopian tube. No adhesions of contents to sac. Wall of sac consisted of two distinct layers; the layer of peritoneum within, and the layer of pelvic fascia from without. Posteriorly, the sac lay on the obturator externus muscle.		Dissecting-room subject. Had died of general debility following right-sided hæmaplegia.
102. LOCKWOOD, C. B., Hernia of the Ovary in an Infant with Torsion of the Pedicle, Brit. Med. Journ., 1895, vol. 2, p. 716.	Infant. Congenital.	Right. Inguinal. Oval swelling three inches long, having the local characteristics of an inflamed strangulated inguinal hernia.	About three-quarters of an inch from internal abdominal ring pedicle had made a half-turn upon itself, thus causing vascular engorgement of ovary and of the fimbriated end of tube.	Pedicle transfixed, tied, and stump fixed beneath internal oblique and transversalis muscles. Ovary and tube removed. Sac excised. Radical operation.	Recovery.
103. LOCKWOOD, C. B., A Case of Hernia of the Ovary in an Infant with Torsion of the Pedicle, Brit. Med. Journ., 1896, vol. 1, p. 1442.	6 months. Congenital.	Right. Inguinal. Skin over swelling red and inflamed. Hernia extended into right labium majus.	Two drams of brownish fluid. Ovary, tube, and broad ligament lay free in sac. Canal was roomy and seemed incapable of constricting its contents. Internal abdominal ring was capacious. Pedicle was twisted.	Removed ovary and tube. Excision of sac. The half-turn was the cause of the vascular engorgement of the tube, of the ovary, and broad ligament.	Recovery. Microscopically, ovary was full of blood and contained numerous ova.
104. LOZANA & PONCE, Hernie inguinale étranglée de la trompe chez une enfant, Rev. de Chir., 1900, vol. 40, p. 560.	4 years.	Right. Inguinal. Irreducible. Walnut-sized. Genital discharge. No symptoms of ileus.	Tube, ovary, and broad ligament.	Removed adherent extremity of the tube.	Recovery.
105. MAASS, H., Ovarialhernien mit Stieldrehung beim Kinde, Berlin. Klin. Wochenschr., 1898, vol. 35, p. 776.	10 months. Congenital.	Right. Inguinal. Irreducible. Dull percussion note. During last two days swelling became painful. Vomiting. Labium majus was swollen and edematous and mass size of a dove's egg. Could be easily palpated through skin.	Clear sac fluid. Ovary, tube, broad ligament and parovarium. Torsion of pedicle first diagnosed at operation. Removed adnexa were much enlarged and infiltrated with blood.	Broad ligament twisted several times on its axis. Removed adnexa. Removed hernial sac.	Recovery.
106. MACÉ & MONCANY, Hernie congénitale labiale de la trompe et de l'Ovaire chez une enfant de sept mois, Bull. de la Soc. d' Obst. de Paris, 1905, vol. 8, p. 138.	5 months. Congenital.	Right. Inguinal. Irreducible. Small tumor in superior portion of right labium majus. External genitalia normal. Clinical diagnosis: Irreducible inflamed cyst of canal of Nuck.	Mass was bluish-black, congested; oval, almond-sized tumor. Ovary infiltrated with blood. No malformation of external genitalia.	Ligation of pedicle. Removed mass which consisted of herniated ovary and tube. Closure of operative wound.	Recovery.
107. MANLEY, TH. A., Report of a Case of Hernial Extrusion of the Ovary and Fallopian Tube, Annals of Gynecol., 1892–1893, vol. 6, p. 606.	Infant. Congenital. Father also had a large irreducible inguinal epiplocele.	Right. Inguinal. Irreducible. Sensitive. Painful. Truss aggravated symptoms.	Ovary, tube, and broad ligament. Ovary had firm, unyielding adhesions to adjacent parts.	Radical cure for hernia. It is not stated what disposition was made of the adnexa.	Recovery.
108. MARTIN (KOSSMANN), Hernien der Eierstoecke, Handbuch der Krankheiten der weiblichen Adnex Organe, 1899, vol. 1, p. 73, vol. 2, p. 157.		Left. Inguinal.	Ovary and tube. Right ovary was the seat of a cyst size of a man's head. Left ovary and tube were normal. Uterus was displaced by cystoma upward, forward, and to the left	Contents of hernial sac reduced into abdominal cavity. Excision of hernial sac.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
109. MAY, E. H., A Case of Hernia of the Ovary in a Child Seven Months Old. Brit. Med. Journ., 1898, vol. 1, p. 1389.	7 months. Congenital.	Left. Inguinal. Irreducible. Swelling in left groin. Constipation for two days. Vomiting for one day. Swelling extended from left internal abdominal ring to left labium majus. Tense swelling. Dullness. No impulse on crying.	Blood-stained fluid. Dull purple mass resembling a damson. Ovary and fimbriated end of tube were black and swollen from congestion, which was due to the kinking, as there was no constriction at the internal ring.	Pedicle formed by Fallopian tube; had double kink. Mass removed.	Recovery.
110. MCCOSH, A. J., Congenital hernia of the ovary, Transactions of the American Surg. Association, Philadelphia, 1895, vol. 13, p. 481.	Congenital.	Painful.	Tube, ovary, and round ligament.	What was done is not stated.	Recovery.
111. MENCIÈRE, LOUIS, Hernie de l'ovaire chez la petite fille, Rev. Mensuelle des Maladies de L'Enfance, 1897, vol. 15, p. 270. 3 cases.	Case 1. 11 years. Mother and grandmother each have a left inguinal hernia.	Left. Inguinal. Reducible. Egg-sized swelling.	Ovary and tube.	Radical cure. Hernial contents reduced into abdominal cavity; they were healthy.	Recovery.
	Case 2. 3 years.	Bilateral. Inguinal. Left hernia soft, dull, reducible tumor dove's egg-sized.	Left hernia contained tube and ovary. Tuberculosis of hernial sac. Ovary and tube were the seat of tuberculous granulations. Tubercular process extending beyond collar of sac.	Radical cure. Removed adnexa. During operation, patient had a bowel movement; fecal matter got into the wound and infection followed.	Death. Pleural and peritoneal tuberculosis.
	Case 3. 2 years. First noticed one month ago.	Left. Inguinal.	At level of neck of sac is found ovary and part of tube.	Reduced organs. Radical cure of hernia.	Recovery.
112. MORGAN, J. H., A Case of Right Ovarian Hernia with Twisted Pedicle, Lancet, 1897, vol. 1, p. 1340.	8 months. Congenital. A brother had died of strangulated inguinal hernia.	Right. Inguinal. Irreducible. No vomiting. No constipation. Indistinct rounded body palpable in right inguinal region, unaltered in size when child cries.	Thin-walled sac contained one dram of blood-stained fluid, ovary, and slender pedicle twisted upon itself to the extent of 2½ turns.	Stalk was found to consist of tube and broad ligament. Removed ovary and pedicle.	Recovery.
113. NASSI, C., Hernie inguinale de l'ovaire, de la trompe, et d'une corne utérine rudimenttaire, Rev. de Gyn. et de Chir. Abd., 1898, vol. 2 p. 375.	36 years. Congenital.	Right. Inguinal. Became irreducible. Of elastic consistency. Good general condition. Menses normal. Increase in size when patient stands up and when she coughs. Accompanied with gastro-intestinal disturbances. Body of uterus was atrophied and in normal position. Left adnexa palpable.	Ovary and tube. Rudimentary uterine horn. Ovary contained numerous small cysts.	Removed rudimentary uterine horn, ovary, and tube. Removed peritoneal sac.	Recovery.
114. NICOLL, J. H., Ovary and Tube Which Occupied Upper Portion of the Labium in a Female Infant, Glasgow Med. Journ., 1902, vol. 58, p. 40.	7 months. Congenital.	Inguinal. Symptoms suggestive of strangulated hernia. Constipation. Pain. Tenderness. Increased size and tension of swelling. Clinical diagnosis: Encysted hydrocele of canal of Nuck.	Ovary and tube.	Operation. Ovary and tube had become strangulated by torsion of pedicle. Removed adnexa. Pedicle ligated and put back in abdomen.	Recovery.
115. OWEN, E., Torsion of Ovarian Pedicle in Hernial sac, Lancet, 1896, vol. 1, p. 765.	Eleven weeks. First noticed two days before patient was brought to hospital. Congenital.	Right. Inguinal. Irreducible. Hard, tender swelling in right labium majus continued in the inguinal canal as a firm, cord-like projection. Patient vomited several times and there was slight diarrhea. No impulse when child cried.	Two drams blood-stained fluid. Pedicle formed by broad ligament containing tube and ovarian vessels; was twisted in the direction opposite to that of screw. These organs were black from congestion. Ovary was not strangulated, the slender pedicle lying quite loose in the neck of the sac.	Pedicle ligated. Ovary, tube, and parovarium removed.	Recovery.
116. OGÉ, ANTHIME, Des hernies de l'utérus et des annexes, Thèse de Paris, 1900.	71 years. Acquired. About ten years ago while lifting heavy weight. Three para. Menopause at fifty years of age.	Left. Inguinal. Irreducible. Hard, tense, orange-shaped and sized swelling extending into labium majus. Pedicle of mass is distinctly above Poupart's ligament. Symptoms of ileus. Clinical diagnosis: Strangulated Hernia.	Loop of much congested small intestine, uterus, and left adnexa; the latter were adherent to sac.	Intestine and uterus reduced into abdominal cavity. Removed tube and ovary. Radical cure.	Recovery.

TABLE III — TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
117. PARKER, R., Double Inguinal Hernia of Ovary and Fallopian Tube; Absence of Vagina and Cervix Uteri; no Menstruation; Treated by Herniotomy, Brit. Med. Journ., 1893, vol. 1, p. 69.	24 years. Probably congenital. Patient was thoroughly of feminine aspect.	Bilateral. Inguinal. Irreducible. Truss aggravated symptoms. Ovoid swelling in each groin. Patient has never menstruated. Absence of vagina and cervix uteri.	Each hernia had a sac. Sac was shut off from the other sac which communicated with the peritoneal cavity. Contents on each side were an ovary and the free end of the Fallopian tube.	Removed ovary and tube on each side. Reduction appeared non-feasible.	Recovery.
118. PERKINS, G. W., Case of Inguino-labial Hernia; Ovary, Fallopian Tube and Cornu of Uterus in Sac, Annals of Surgery, vol. 21, 1895, p. 691.	40 years. Acquired. Followed an injury at age of six years. Two children. One miscarriage.	Left. Inguinal. Swelling in left groin. For many years reducible; now irreducible. Orange-sized mass in left labium extending through external ring into inguinal canal. Dull percussion note. Impulse on coughing and straining. Uterus markedly inclined to the right.	Cystic ovary, attached by a ligamentous band to the pale-pink mass of tissue and tube with free fimbriated extremity; proximal end attached to same mass.	Sac opened. Removed tube, ovary, and mass of tissue resembling uterine tissue.	Recovery.
119. PITT-TAYLOR, Irreducible Hernia of Fallopian Tube and Ovary in a Child, Brit. Med. Journ., 1899, vol 2, p. 853.	16 months.	Left. Inguinal. Irreducible. Swelling in upper part of left labium. Walnut-sized swelling; hard, tender, no fluctuation and extending upwards to the external abdominal ring. Had been reducible.	Tube greatly distended with caseous material; it gave the naked eye appearances of a tuberculous salpingitis. Ovary intimately adherent to tube, otherwise healthy.	Removed sac and tube. The author does not state clearly what he did.	Recovery.
120. QUADFLIEG, Zur Kasuistik der Hernia Ovarica Inguinalis, Muenchener Med. Woch. 1901, vol. 48, p. 790. 2 cases.	CASE 1. 2 months. Congenital.	Left. Inguinal. Swelling in left inguinal region. Digestive disturbances. Tenderness. Dullness. Clinical diagnosis: Incarcerated Inguinal Epiplocele.	Adherent ovary in state of cystic degeneration and congested tube.	Resection of adnexa.	Recovery.
	CASE 2. 41 years. First noticed nine years ago. Eight para.	Right. Inguinal. Irreducible. At times digestive disturbances. No constipation. No vomiting. Clinical diagnosis: Irreducible Inguinal Epiplocele.	Ovary and tube. Both organs were congested.	Ovary and tube returned into abdominal cavity after dilatation of internal abdominal ring.	Recovery.
121. RAVANIER, Étranglement herniaire, Bull. de la Soc. Anat., 1893, vol. 63, p. 709.		Right. Mild phenomena of strangulated hernia.	Ovary, tube, and omentum. These organs were the seat of suppuration and were adherent to a mass of omentum also suppurating. It is probable that the epiploitis was primary and the tubo-ovarian infection secondary.	Removed hernial contents.	Not stated.
122 RIGBY, H. M., A Case of Torsion of the Ovary in a Hernial Sac, Lancet, 1905, vol. 2, p. 360.	3 months. Congenital.	Right. Inguinal. Irreducible. Caused a good deal of pain. Overlying skin inflamed. Globular swelling extending up to right external ring. Occupied upper part of right labium majus. No impulse. No abdominal symptoms. Clinical diagnosis: Inflamed Encysted Hydrocele of Canal of Nuck.	Dark fluid blood. Dark purple, oval-shaped body. Ovary and tube much congested and nearly black. At internal ring a narrow neck was found composed of broad ligament and tube twisted upon itself.	Neck was untwisted, transfixed with a pedicle-needle and ligatured with catgut. Ovary and tube removed. No attempt was made to dissect out the sac close to the ring.	Recovery.
122b. Cook County Hospital. Case 464269. John Dill Robertson.	22 months. Congenital.	Right. Inguinal. Reducible. Hernia forced out on crying.	Tube and ovary.	Herniotomy (Bassini) Returned hernial contents into abdominal cavity.	Recovery.
123. ROGNER GUSENTHAL, Hernia Obturatoria Incarcerata Completa mit Vorlagerung der Tuba und des Ovariums, Wiener Med. Presse, 1893, vol. 26, p. 1010.	66 years. Condition had existed twenty-six years. Acquired. Nullipara.	Right. Obturator. Strangulated. Swelling in upper part of Scarpa's triangle. Tenderness over swelling. Digestive disturbances. Ischuria. Symptoms of ileus. Fecal vomiting. Clinical diagnosis: Strangulated Femoral Hernia.	Intestine, ovary, and tube. These organs were in a state of beginning gangrene. Foul-smelling hernial fluid.	Fluctuating swelling beneath pectineus; this muscle was divided longitudinally and a hernia of size of a hen's egg was exposed. Neck of hernial sac constricted between the bone and a moderately sharp upper border of the obturator membrane. Sac opened. Attempt made to create an artificial anus.	Died five days after operation.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
124. ROSANOFF, W. W., Leistenbruch des schwangeren Uterus; natuerliche Fruehgeburt, Arch. f. Klin. Chir., 1894–1895, vol. 49, p. 918.	45 years. First noticed five years ago. Acquired. Thirteen pregnancies.	Left. Inguinal. At first reducible; became irreducible one year ago. After the thirteenth labor one could easily palpate uterus and adnexa in hernial sac. Uterus reducible. One could palpate the hypertrophied round ligament.	tube, and Ovary, uterus, and intestinal loops.	Hernial ring admitted fist. Removed a large portion of skin overlying sac. Complete removal of hernial sac. Reduction of intestine and uterus. Ablation of ovary and tube. Closure of abdominal wall.	Recovery.
125. SCHNITZLER, J., Torquierte Ovarialhernie, Wiener Klin. Rundschau, 1903, vol. 17, p. 793.	6 months. Congenital.	Left. Inguinal. Irreducible. Walnut-sized. Tenderness. No vomiting. No ileus.	Blood-tinged fluid in sac. Tube, ovary, and broad ligament. Areas of superficial necrosis in ovary. Torsion of pedicle behind external abdominal ring. No compression of pedicle in hernial canal. Ovary swollen and congested.	Removed tube and ovary. Radical cure for hernia.	Recovery.
126. SCHOPF, F., Hernia Obturatoria tubæ et ovarii sinistra, Wiener Klin. Wochen., 1903, vol. 16, p. 207.	68 years. Four pregnancies.	Left. Obturator. Strangulated. Bilateral reducible femoral hernias co-existed. Ileus. Radiating pain in left thigh.	Brownish-black hernial fluid. At autopsy it was noted that uterus was deviated toward left obturator foramen. Tube and 10 cm. of the ileum were incarcerated in obturator canal. Tube, ovary, and intestine.	Longitudinal incision in Scarpa's triangle, internal to the large vessels. Ablation of ovary and outer end of tube. Drainage closure.	Death.
127. SCHWARTZ, E., Hernie inguinale des deux canaux de Mueller, Absence total de vagin, Congrès français de chirurgie, 1892, vol. 6, p. 437.	26 years.	Bilateral. Inguinal. Irreducible. External genitalia normal. No menses. Sexual desire pronounced.	On right side hernial sac contained intestine and a reddish body having the appearance of a miniature uterus and the tube. Examination of mass removed from right side shows a tube and ovary which has never functionated and a small uterus without a cavity. Uterus formed of non-striated muscular fibres and numerous vessels. Left side contained a fibre-muscular cord-like band resembling round ligament, and a mass somewhat analogous to the small uterus found in right hernial sac.	Radical cure of hernia. Resection of tube, ovary, and body upon which they are attached. On right side stump reduced.	Recovery.
128. SÉBIAN, H., Les hernies de la trompe et de l'ovaire, Thèse de Paris, 1904, 2 cases.	CASE 1. 26 years. First appeared after last pregnancy two years ago. Acquired.	Nature of hernia not stated. Hen's egg-sized swelling; painful at menstrual periods.	Clear liquid. Cystic ovary and tube. The mucosa of tube is thickened, and is covered by muco-purulent deposit.	Resected adnexa. Radical cure for hernia.	Recovery.
	CASE 2. 23 years. Nullipara.	Right. Inguinal. Irreducible Painful at menstrual periods.	Tube slightly adherent and absolutely normal ovary.	Reduced organs. Bassini's operation.	Recovery.
129. SOULIGOUX, Hernie inguinale de la trompe et de l'ovaire gauche et du ligament large du même côté, Bull. & Mém de la Soc. de Chir., 1909, vol. 35, p. 838.	25 years. Twelve years ago. Acquired. Appeared following heavy lifting. Three normal pregnancies.	Left. Inguinal. Reducible; lately became irreducible. Hen's egg-sized; with each pregnancy there was an increase in volume of hernia. Tumor is now fist-sized and painless. Vomiting. Clinical diagnosis: Strangulated Hernia.	Ovary, tube, and serous fluid in sac. Pedicle formed by left broad ligament. In interior of sac was a gelatinous mass. Hernia consisted of two pockets: one was a cystic pouch communicating with the tube; in the other were loops of intestine and omentum.	Removed mass consisted of broad ligament, tube, and of ovary containing a multitude of cysts. Removal of gelatinous mass. Radical cure for hernia. Pedicle ligated and cut.	Not stated.
130. SUTTON, BLAND, Hernia of the Ovary and Fallopian Tube in an Infant, Medical Press and Circular, 1896, vol. 113, p. 582.	4 months.	Left. Inguinal. Walnut-sized swelling in left groin.	Hernial fluid. Ovary with cyst in uterine pole. Ampulla of tube.	Operation. Radical cure for hernia. Removed ovary, tube, adjacent parts of meso-salpinx.	Recovery.

TABLE III.—TUBO-OVARIAN HERNIAS (*Continued*)

Bibliographical References.	*Age. Congenital or Acquired. When First Noticed. Miscellaneous, etc.*	*Side Affected. Anatomical and Clinical Type of Hernia. Salient Symptoms.*	*Contents.*	*Treatment.*	*Result.*
131. TAILHEFER, Hernie de l'ovaire prise pour une hernie du rein, Bull. & Mém. de la Soc. de Chir. de Paris, 1904, vol. 30, p. 45.	5 months.	Clinical diagnosis: Strangulated Inguinal Hernia.	The mass removed, to the naked eye, resembled a kidney; microscopical examination showed that it was an ovary and a tube.	Removal of hernial mass.	Not stated.
132. TSCHERNING, E., Ueber Ovarialhernien, Arch. f. Klin. Chir., 1904–1905, vol. 75, p. 486.	6 months. Congenital.	Irreducible. Right. Inguinal. Collapse. Vomiting. No ileus. Olive-sized swelling extending in right labium majus. Poorly nourished child. In left inguinal region, there was a small reducible hernia.	Ovary, tube, and part of broad ligament. Organs were congested in canal of Nuck. There was torsion of ovarian pedicle.	Reposition was prevented by narrow hernial ring. Removed hernial contents.	Recovery from operation, later died from enteritis.
133. TUBBY, A. H., Some Unusual Forms of Hernia with Remarks Brit. Med. Journ., 1897, vol. 2, p. 968.	4 months.	Left interstitial inguinal hernia of both ovaries and tubes. Oval-shaped swelling in left groin; movable but irreducible.	Right tube and ovary were found lying in abdominal wall just outside of left internal abdominal ring.	Removed left ovary. Stump of left tube was ligatured and it together with right tube and ovary were reduced.	Death. No peritonitis at Post-Mortem.
134. WRINCH, H. C., A Case of Incarcerated Ovary, Canada Lancet, 1899-1900, vol. 32–33, p. 665.	26 years. Six years ago. Acquired. After severe exercise swelling appeared in left groin.	Left. Inguinal. Pain severe at times; worse during menstruation. Menstruation became irregular.	Left ovary and tube adherent to sac.	Operation for radical cure. Removed left ovary and tube. Ovary being small and missbaped.	Recovery.
135. ZURHELLE, E., Zur Kasuistik der Hernia Ovarica inguinalis, Zentr. f. Gyn., 1906, vol. 30, p. 541.	44 years. First noticed three months ago. Acquired. Nine para.	Right. Inguinal. Skin over swelling somewhat distended. Two years previously, after last pregnancy, had a large left-sided parametric exudate.	Right ovary and small portion of tube. Serous fluid in sac.	Removed ovary and tube after ligation of pedicle. Radical cure for hernia.	Recovery.

TABLE IV.—MISCELLANEOUS CASES

136. CARMICHAEL, E. S., Hernia of the Uterine Adnexæ with a Personal Experience of seven cases, Journ. of Obst. and Gyn. of the Brit. Empire, 1896, vol. 10, p. 16. 7 cases.	2 under 1 year. 3 under 5 years. 2 under 12 years.	All inguinal. 3 were bilateral. 3 were right-sided. 1 was left-sided. No other abnormality noted.	In two, tube alone was present in sac. In two, infundibulo-pelvic ligament alone was present in sac. In other cases, ovary and tube.	Ovaries were not removed in any of the cases. Reduced into abdominal cavity.	Recovery.
137. CORNER, E. M., The Contents of Irreducible Inguinal Hernias in Female Subjects and True Hermaphroditism, Brit. Med. Journ., 1908, vol. 1, p. 17. 19 cases.	Age from nine weeks to twelve months.	Inguinal. Left. Right 5; left 3. Right 4; left 4. Left. Left.	Tube—1 case. Ovary—8 cases. Ovary and tube—8 cases. Ovary, tube, bowel, and omentum—1 case. Uterus, ovary, tube, and bowel—1 case.	With simple reducibility return of hernial contents to abdominal cavity. Organs should be sacrificed only when showing marked structural impairment.	Recovery.

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DEPARTMENT OF TECHNIQUE

A SIMPLIFIED TECHNIQUE FOR END-TO-END INTESTINAL ANASTOMOSIS WITH REPORT OF 28 CASES

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IN presenting any new procedure, the author has always to ask himself whether it is worth while for surgeons to spend their valuable time in learning and mastering it. I will give here the reasons why I present to you this method of intestinal anastomosis; if these considerations make you think the method worthy of your attention, study and master it; if, on the other hand, you think the opposite, I hope you will forgive me the loss of time caused in reading them.

Only one row of suture is necessary to insure an anastomosis which can stand a pressure of about thirty pounds without leaking; it can be accomplished in from four to six minutes; it is easier than any other method including mechanical devices; it never causes strictures on the point of anastomosis or adhesions with other abdominal organs; it takes care of the mesenteric angles (dead spaces) in such a way, that leakage from these formerly dangerous parts is impossible; it allows the free passage of fœces and gas immediately after the anastomosis is finished; it makes possible to anastomose intestines of different calibre without any particular difficulty; the anastomosis is technically perfect and no surgical skill can give the surgeon the ability to perform a safer or better anastomosis. These claims are based on the results obtained on over three hundred anastomoses performed on dogs and at the Columbia Surgical Research Laboratory, on 28 patients by the following surgeons beside myself: Frank D. Gray, George Keenan, A. S. Sullivan, J. F. Summers, Franz Torek, James Tuttle, James P. Warbasse—to whom I extend my best thanks for having reported to me their cases.

I will describe the technique and leave for the latter part of the paper more detailed technical and clinical considerations.

I omit all the details, which are common to any work on the intestine and with which surgeons are familiar, such as suturing the mesentery, clamping the two stumps of the gut, and the toilet and preparation of the field of operation; I will only mention that I do not use clamps or forceps, because they take too much room and traumatize the gut. I pass a rubber band through a small rent made in the mesentery and fasten it, as seen in the illustrations. This insures very well against leakage of intestinal contents without in any way interfering with the circulation of the gut or traumatizing it and leaves the field of operation free.

A tube of good resilient rubber of the same length as its diameter, and about one third less than the diameter of the intestine to be anastomosed, is encircled in the middle by a series of catgut loops, which are passed through in the following way: A round needle is threaded with catgut No. 2 or 3. The catgut must be tested to see that it is not easily breakable. The needle is passed through the whole thickness of the rubber tube and made to emerge at about two or three mm. from the point of entrance. It is passed through the whole thickness of the rubber tube again, so as to form a loop about 3 mm. high on the external side of the tube. The needle is passed through the whole thickness of the rubber as many times as is necessary, so as to form a series of external loops of about three mm. in height and at the same distance from one another. The two ends of catgut will emerge at about a distance of three mm. and will be left about six cm. long. Illustration No. 1, A and B, will make plain how to prepare the tube. Such tubes can be prepared beforehand and kept ready by keeping them in a box filled with any sterile powder such as licopodium, talcum powder, etc., preventing air and light from entering the same, so as to keep the rubber resilient for a long time.

The anastomosis is performed in the following way: Two straight seamstress round needles are threaded with about thirty centimetres of silk or linen, not too fine, because a fine thread cuts the intestine when the suture is pulled. One of the needles is passed from within the lu-

men of either of the two segments of the intestine through the whole thickness of the gut and mesentery, traversing the dead space, at a distance of about three mm. from the cut edge, avoiding of course, any blood-vessels. It passes through any one of the catgut loops of the rubber tube; then going to the other segment of the intestine, on the same side, it is passed from without in through the mesentery and intestinal wall, again traversing the dead space. The needle is then brought out again through the intestinal wall and mesentery, and going back toward the first segment of intestine, it is passed under the same catgut loop of the rubber tube, and finally passing through the mesentery and intestinal wall, will come out on the inside of the intestine at a distance of a few mm. from the point of beginning the stitch. It will be noted that the dead spaces have been traversed four times. (Fig. 2.)

The two segments of the gut are closely approximated and the mesenteric angles (dead spaces) are securely closed by tying a double knot which will be on the inside of the intestine. Both needles are then brought outside of the intestine, close to the mesenteric angles. (Fig. 3.) The two segments of the gut are brought over the rubber tube and kept so by a couple of temporary stitches, passing through a loop, so that they will prevent the tube from slipping. (Fig. 4.) The temporary stitches will be knotted only once, and cut close, so that when reached by the circular mattress suture, they can be readily pulled out. If any of the catgut loops do not emerge between the two cut edges, they will be pulled out with a thumb forceps as appears in figure 4. Either of the two needles is passed through the *whole thickness* of the gut, starting near the attachment of the mesentery at about two mm. from the cut edge, coming out at about a distance of two mm. as shown in figure 5. In this way a circular mattress suture which includes *the whole thickness* of the gut is begun, as shown in figure 6 and in figure 17. When the needle goes to the other segment of the gut, it is passed under the catgut loop which is met emerging between the two cut edges. When two of stitches have been put in, the thread will be pulled firmly so as to invert the serosa, and it *must be pulled enough to make all the thread disappear. No thread should be seen between the two segments of the intestine, as shown in figure 7.* When about half of the mattress suture has been accomplished, the thread is held by a forceps and the other needle, on the opposite side, begins the mattress suture in the same way, until the two meet toward about the middle of the intestine. (Fig. 8.) The two threads should come out, each on the opposite segment of the intestine, and emerge, possibly, exactly opposite each other. The thread is then tied with a double knot under the catgut loop, *after having pulled the thread in such a way that no thread is seen between the two segments of the anastomosed gut.* (Fig. 9.) Figure 10 shows the anastomosis completed as far as the circular suture is concerned, with the thread that accomplished the same cut and tied under a catgut loop. When the circular mattress suture is so completed, either of the two ends of the catgut loops emerging between the anastomosis will be clamped by an artery forceps as close as possible to its point of emergency. The index and the middle finger (Fig. 11) will hold back the intestine, while the other hand pulls the catgut. The pulling must be accomplished gently, until the loops which were apparent between the two segments of the intestine have completely disappeared. The other end of the catgut is clamped and pulled in the same way until all the loops have disappeared, and, by gently pulling, the surgeon feels that there is a certain resistance which means that the catgut has been pulled close to the rubber tube, which is on the inside of the intestine, as it is schematically shown in figures 15 and 16. When all the catgut loops have disappeared, the two ends will be tied and cut close, so that the inverted gut will bury the knot and the appearance of the anastomosis will be as figure 12. In pulling the loops, the catgut might break, especially if its strength has not been tested, as advised above; there is nothing to fear; the only thing to do is to pass a strand of catgut around the line of suture, between the two segments of the anastomosed intestine and tie it.

A very important step and one to be very careful about, is that the thread which is used in the circular mattress suture *must completely disappear and none of it be seen between the two cut edges*, and this is attained very easily by gently but firmly pulling until it completely disappears. In pulling the thread the surgeon must be very careful to pull it in the same direction as the axis of the intestine, as shown in figure 13. That is, the surgeon must pull the thread parallel to, or even in a lower direction than the intestine, because by so doing he will be able to firmly and closely approximate the serous surfaces without tearing them. By pulling the thread in any other direction, as shown in figure 14, and as it is done, when for instance the left hand is holding back the gut, and the right hand

is in a position above and not parallel or lower to it, the thread will cut the intestine just as the grocer cuts butter or cheese by pulling one end of a wire or thread in the opposite direction of the other. I must insist on these points because the only failure that I know of in performing an anastomosis by this method, has been caused by the fact that the surgeon pulled the thread against the intestine, and produced two tears, which we thought, necessitated reinforcing stitches. This is always dangerous, because in the method described the tension of the mattress suture is equally and harmoniously divided all over the line of anastomosis; but in putting in reinforcing stitches there will be greater tension where they have been placed and the thread is likely to cut the intestine. By pulling the thread as shown in figure 13, it is impossible to tear the gut, and with a little exercise it is easier to pull it in this way than in any other, because the thread runs very freely; but if on account of any unforeseen accident, it should happen that the gut is torn, if the tears are very small nothing has to be done; if the surgeon judges that they are too big, the best thing I could advise is to begin again the anastomosis. I caution the surgeon against these accidents which will never occur, and have never occurred in my experience, even in cases where the intestine was very brittle, if the technique as explained above is followed in all the details, which make the procedure safe and easy.

By examining figures 15 and 16, the value and simplicity of this method will easily be understood. It is seen that as the intestine is mounted on the rubber tube and sustained by it, it is easy to pass the continuous mattress stitch. By keeping the stitch taut and tucking in the serosa, a considerable inversion is already obtained. When the mattress suture, *which passes through all the three coats*, is finished and the thread tied, it will be seen that by obliterating the catgut loops, the silk will be brought down, carrying with it the serous surfaces and burying everything that came in contact with the intestinal cavity, under so large a surface of serosa that the union between the surfaces in contact will be so close as to make leakage and infection impossible. *The same process takes place all along the suture line and the terrible and dangerous mesenteric angles, dead spaces, are automatically as completely secured as any other portion of the gut. Everything is buried — catgut, silk, knot, tube — under a large portion of serous surfaces.* (Fig. 16.)

Intestines of different calibre can be anastomosed with the same facility and rapidity as if their calibre were the same; it is obvious that the mattress stitch should take a longer bite on the larger segment, and a tube one third less than the smaller segment be used; it is advisable to put in at least four temporary stitches, dividing with them the larger segment in equal parts.

I have never seen or encountered a stenosis, and I am under the firm impression that it is impossible to cause one even by making the continuous mattress stitch irregular. I explain this fact in the following manner: The rubber tube, being elastic, is compressed by the inverted cut edges (Fig. 16) and exercises a gentle and continuous pressure on the suture line, facilitating the formation of adhesion between the serous surfaces only at their extremity of contact.

From the experience gained in long experimental work and the results obtained on human beings by the above named surgeons and myself, I feel that I can conscientiously draw the following conclusions: This is the easiest, most rapid, and safest method of intestinal anastomosis. Experimentally I have made as many as six anastomoses on dogs at one sitting in about 40 cm. of ileum, and in Budapest before the Surgical Session of the International Medical Congress, I killed one of these dogs. No adhesions were found, and only one anastomosis was traceable, and to show that really there were six of them, I had to cut off the gut, and by holding it up against the light, a tiny line of scar tissue alone demonstrated that the six anastomoses had been made. There were no adhesions and no strictures. I do not think that with any surgical skill, such happy results could have been obtained by using any other method. The absence of adhesions and strictures proved by the autopsy of all the dogs operated upon, had the most brilliant confirmation on human beings.

In the first case operated on by Dr. Sullivan, who has been my collaborator during the experimental work on animals, as reported below, on opening the abdomen one month after the anastomosis had been made, for another operative purpose, the anastomosis could hardly be found. I quote the words of Dr. Sullivan: "The anastomosis was very difficult to discover and in every way resembled those which we secured in the laboratory on normal intestine." I want to emphasize this result, because even in a case which had been operated upon on account of old adhesions, and after so many operations, the new anastomosis could hardly be discovered.

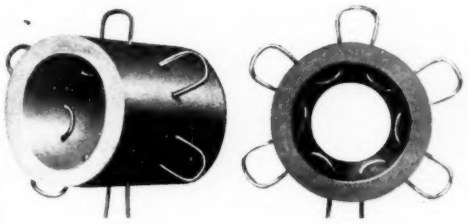
As previously stated, the rapidity of the procedure is most remarkable; often it took me

only four minutes to perform a complete anastomosis, and it took exactly that time, when, by request, I made an anastomosis before the Surgical Session of the International Medical Congress of Budapest. In a case described below, the patient's life has really been saved by the rapidity of the operation, which took about four minutes, thus reducing the shock to a minimum. It is the easiest method because only one row of suture is necessary and suturing is made easy by the fact that the intestine is supported by the rubber tube; the dead spaces of the mesenteric angles are automatically closed without any difficulty and in a way that the best surgical skill cannot equal.

I cannot urge strongly enough the advisability of trying the method on the cadaver or on dogs before using it on human beings; the technique is extremely easy, but like everything new it must be mastered.

In preparing the anastomosis tube it is better to use a round needle which does not cut the rubber. Plain catgut No. 3 has generally been used, but in case of an emergency any suture material may be substituted. Catgut has been preferred because the loops stand out prominently between the cut edges, even when wet, and they slide without cutting the rubber. In emergency cases any tube smaller than the gut can be used.

The advantages of the method are apparent: There is absolutely no stenosis along the suture line, even when a small tube is used, and time seems to improve the anastomosis, as it has been shown by numerous specimens dating several months. It precludes the necessity of making lateral anastomosis in many cases and of one's being compelled to use mechanical devices when the condition of the patient requires a quick operation; the anastomosis made by mechanical devices being neither more rapid nor as safe, and not always at hand. Gas and fœces pass freely through the tube, the diameter of which is almost equal to that of the intestine. No foreign body, not even silk, is in the abdomen a few days after the operation. The elasticity of the rubber tube prevents kinking of the intestines along the suture line, and it helps the peristalsis. But the main advantages are: Great rapidity, safety, little trauma and therefore no formation of adhesions; the calibre of the two segments of intestine to be anastomosed is of no importance. The blood supply of the line of anastomosis is ideal, far better than in the lateral method. In fact, the union of the serous surfaces takes place at the outer part without the interference of any stitch (Fig. 16), which always strangulates the blood-vessels, in this way leaving the blood supply where the anastomosis takes place in absolutely normal condition. The various abdominal organs do not come in contact with any foreign bodies, as the thread used in the Lembert suture. The serosa is very little inflamed, because the line of union did not suffer any traumatism, such as passing the needle, or handling for a long time with already infected hands, pads, and instruments. The adhesion between the two cut edges takes place by the little exudation derived from the contact of the two inverted serous surfaces, the reaction of which is very mild, so that there is no chance of having a large space of inflamed serosa, as it happens when the two cut edges of the intestine are crushed between metallic buttons.



A B

Fig. 1. Two views of the tube which make its preparation easy and show how catgut loops are formed around rubber tube.

The only objection that could be raised against the method is the introduction of a foreign body into the intestine. The objection seems very strong, but there is no ground to take it seriously. The intestine is made for the passage of foreign bodies, and if we introduce a foreign body which can be easily expelled, the objection is of no moment. In fact, the experience on human beings taught me, that when a tube is too long sometimes it has difficulty in passing, as shown in the case of Drs. Sullivan, Torek, and myself, which have been described in the American Journal of Surgery, September, 1910, to which I refer those who desire a detailed history of thirteen cases operated upon. In those cases we all used tubes of about three cm., and it is easily seen that where there are angulations of the gut caused by adhesions, the tube may have difficulty in passing through. But it is sufficient to shorten the tube, to make it of the same length of its diameter, so that it rolls like a compressible ball, and its expulsion will take place without any difficulty whatever, as has been proven in other cases. In one on which I performed the

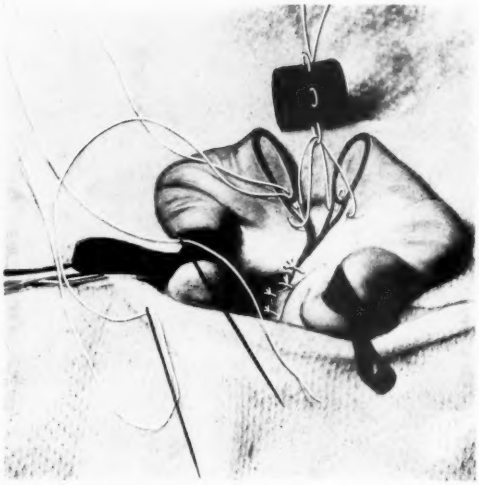


Fig. 2. Mattress stitch, insuring mesenteric angles (dead spaces).

operation the tube had passed at the eighth day, although there were many adhesions.

Often I had trouble in finding the tube when examining the fœces; it is advisable to dilute the fœces with water, otherwise the tube filled with fœcal matter will not be noticed. In many cases while working on dogs I have been unable to trace the tubes, but at the autopsy I never found any in the intestine, which indicates that if the fœces are not washed with much water the tubes can be overlooked.

Fig. 3. Mattress stitch of Fig. 2 tied and needles brought out close to mesenteric angles. Right side shows how gut is put over rubber tube. In this figure and the following ones the suture of the mesentery has been omitted, so as not to confuse it with the mattress suture of the anastomosis.

The anastomosis of the sigmoid deserves special remarks. It is absolutely indispensable to pull the silk or linen of the circular mattress stitch as indicated in figure 13. Otherwise, the gut, being generally exceedingly friable, will tear; care must be taken to invert the serosa well, as the intestinal wall is often very thick; the epiploic fat near the cut edges should be tied with catgut and cut close to the knot, and as many temporary stitches as necessary to keep the two segments of the gut in contact must be put in.

I think it is impossible to make a safer intestinal anastomosis. Failures will of course occur,

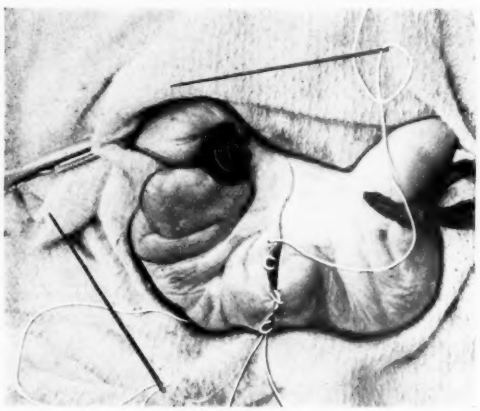


Fig. 4. Rubber tube inside the gut, temporary stitch between the two segments of the gut, catching loop.

Fig. 5. Beginning of the mattress suture passing through the whole thickness of the gut. See Fig. 15.

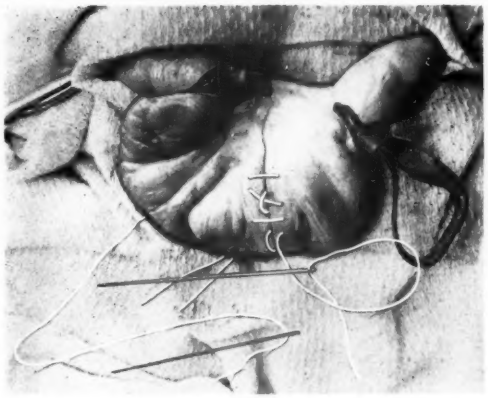


Fig. 6. Mattress suture before pulling the thread. Thread is passed under the loop. See Fig. 15.

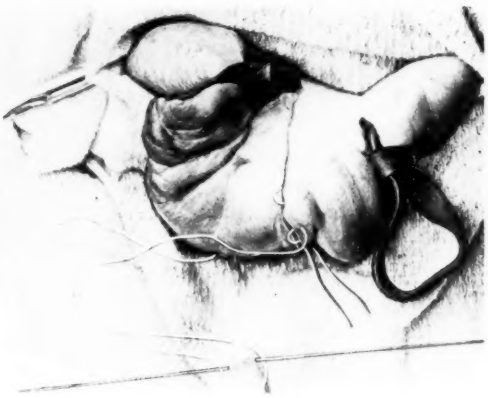


Fig. 7. Thread of mattress suture pulled. Note that no thread is seen between the two segments of the gut. Compare with Figs. 15 and 16.

but I feel sure not on account of the anastomosis itself, but on account of the condition of the patients, as in the cases which I will report later. In this method the dead spaces of the mesenteric angles are completely eliminated as far as danger of leakage from imperfect approximation of serous surfaces is concerned. I never had leakage at the mesenteric angles in over two hundred cases on dogs, and twenty-eight on human beings, so that I can without hesitation state that this method takes care of the mesenteric angles in such a way as to eliminate any danger from that formerly dangerous spot, and it does it in a way that no surgical skill could do, because, after having closely approximated the two leaves of the mesentery, pulling the catgut loops produces such an inversion of the serous surfaces (Fig. 16) as to make leakage impossible. Having eliminated the dangerous mesenteric angles, is there any advantage left in favor of the lateral anastomosis? Some one could tell me that the blood supply is left in a better condition in the lateral than in any method of end-to-end anastomosis, and apparently he reasons very well. The blood supply of the intestine comes from the mesentery, so that in performing lateral anastomosis, if we open the intestine far from the attachment of the mesentery, the blood supply is almost intact.

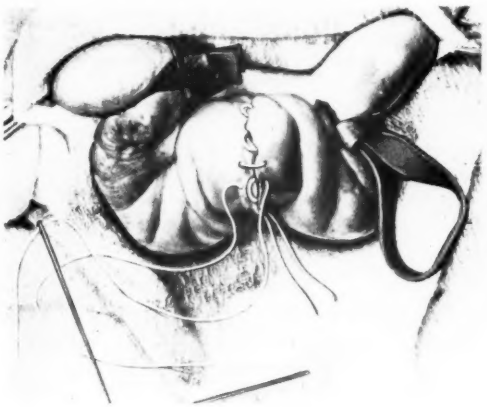


Fig. 8. Ending of mattress suture. The two ends of the thread come out of the gut opposite each other.

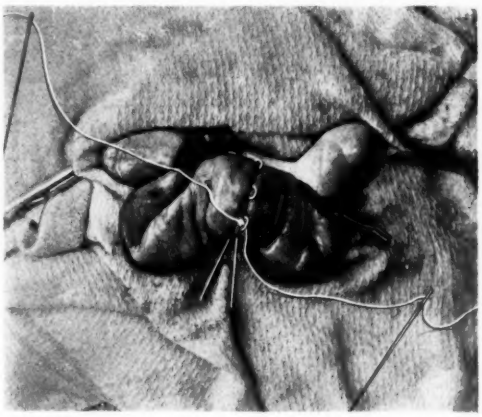


Fig. 9. The two ends of the thread used in the mattress suture are tied with a double knot under a loop.

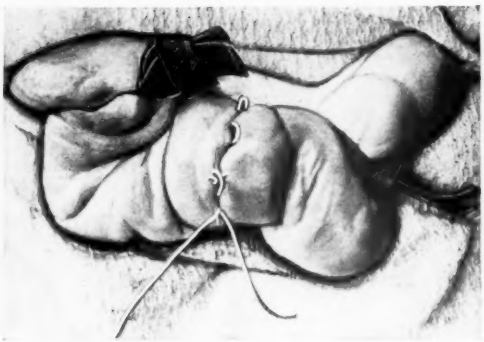


Fig. 10. After the two ends are tied, they are cut close to the knot. The two ends of catgut used to form the loops are seen emerging between the two segments of the gut.

It is so only in theory, however. Intestinal clamps are to be left in place for a considerable time and by the pressure they exercise upon the blood-vessels they certainly do not help them. Putting two rows of sutures and sometimes a few additional stitches brings the suture very close to the attachment of the mesentery, where the blood supply comes from. In my method the blood supply on the line of anastomosis is in an ideal condition. Look at the illustrations, 15 and 16. The line of suture is about 2 mm. from the cut edges. When the anastomosis is completed, by pulling the catgut loops the suture line is

Fig. 11. Way of pulling catgut so that the loops disappear and the serosas of the two segments anastomosed are inverted. See Fig. 16.

Fig. 12. Anastomosis completed, shows how point of anastomosis must appear when catgut loops have disappeared. Note that no thread or knot is visible because buried under the inverted serosa as shown in Fig. 16.

brought toward the inside of the intestine and lies against the rubber tube. The two serosas of the gut and the approximated leaves of the mesenteric angle are in close contact — of at least 2 mm. — and there is where the union between the two ends of the gut takes place. There is no suture and therefore the blood supply is not interfered with, while in any other method where the union is supposed to take place the blood supply is strangulated by the sutures, which cannot fail to stop any blood from flowing at this point. Lateral anastomosis should only be used when the two stumps of the gut cannot be approximated without tension; in all other cases the method presented is safer, quicker, and gives more satisfactory results.

The cases operated will be divided into two groups: anastomosis made between segments of the small intestine and anastomosis made between segments of the large intestine. I never had any opportunity of performing anastomosis between the small and the large intestines in human beings, but I am under the impression, from the results obtained in my experimental work that the results would be just as good. Of the cases operated seventeen were anastomosis of the small intestine, eleven of which were for strangulated hernias; one for old adhesions causing stenosis; another operation was because of stenosis occurring in the portion of the gut which had been previously anastomosed with the lateral method; another one was a case of injury to a blood-vessel of the mesentery, and still another was traumatic injury of the gut. Of the ones operat-

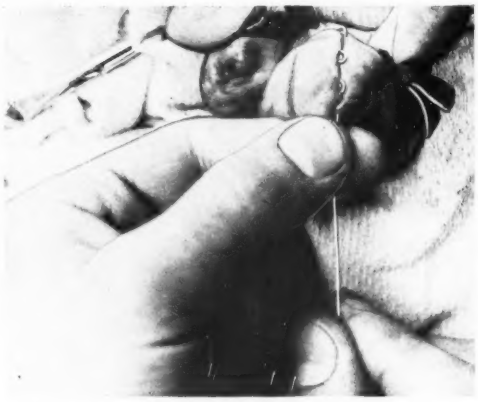


Fig. 13. Right way of pulling thread used for mattress suture; both hands must be on the same plane, so that the thread is pulled parallel to suture line; the fingers against the intestine must be close to suture line.

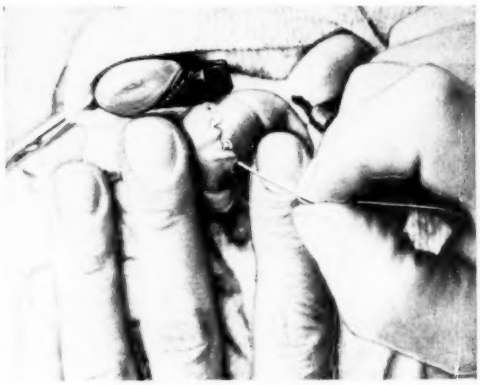


Fig. 14. Wrong way of pulling thread used for mattress suture; note that the hand pulling the thread is not parallel to suture line and therefore the thread is cutting the intestine.

ed in the large intestine, all eleven were carcinomata of the sigmoid and rectum. I will report the unsuccessful cases, because they show us what should have been done to make them successful, and some of the most interesting successful ones.

The first unsuccessful case was the one that I operated in connection with Dr. Tuttle, for carcinoma of sigmoid. The intestine was very brittle, and the silk used in the circular mattress suture was pulled perpendicularly to the intestine, this tearing the serosa in two places. Dr. Tuttle thought it advisable to put in two reinforcing Lembert stitches. The patient developed peritonitis, and on the third day the abdomen was reopened. There was leakage, but only where the reinforcing stitches had been put in. An artificial anus was made, but the patient died three days later. This case emphasizes the fact that one must be very careful not to pull the silk perpendicularly, but as explained, parallel to the intestine.

Another case was a carcinoma of the sigmoid, operated at the Skin and Cancer Hospital with Dr. Torek. The tumor was very large and adherent to the peritoneum, and a large dissection was necessary. An anastomosis was performed and seemed to be very successful. The patient died two days after the operation without any sign of peritonitis and the anastomosis looked perfect in every way. This death was certainly to be attributed to old age and shock.

Another unsuccessful case was an anastomosis between the lower part of the rectum and the sigmoid. As a preliminary step an artificial anus was formed. The tumor was located in the upper part of the rectum and involved the lower part of the sigmoid. The sigmoid was pulled down and anastomosed to the lower part of the rectum. The anastomosis looked very good, but after a few days, sloughing of the tissues began, with resulting gangrene in that portion of the sigmoid which had been pulled down. The patient recovered but had to use the artificial anus. In this case the failure of the anastomosis was due to the fact, that the blood supply of the sigmoid was very poor and therefore there occurred gangrene of that portion of the gut.

Another unsuccessful case was operated by Dr. Warbasse at the German Hospital in Brooklyn. The patient was a boy who had been run over by an automobile. He had a fractured skull, fracture of several ribs and a big opening in the abdomen from which the intestines were coming out, a part of it having been torn. This portion of the intestine, which was in a very bad condition, was cut and an anastomosis was performed. The child died seven hours after the operation, and you can see from the specimen that the anastomosis could not have been done in a better way, or have been more successfully accomplished by any other method, as far as anastomosis is concerned. The shock received by the patient through the operation was slight. It only took Dr. Warbasse about five minutes to perform it. Of course the other injuries and the general shock were so serious that the patient was unable to survive.

I will here describe a case in which I think that by any other method I would have been unable to save the patient's life. I was called at two o'clock in the morning and I found a young man about twenty-eight years of age, who had sustained a stab wound in the abdomen, during a quarrel. Pulse was over 200, the patient very pale, and a wound was found to the left of the umbilicus about 3 cm. in width. I immediately performed a laparotomy, and found a great quantity of blood in the abdominal cavity, but no fœcal matter. Upon pulling out the small intestine I found a cut through the mesentery, severing an artery and other small blood-vessels. Fearing gangrene from loss of blood supply, I dissected about 6 cm. of small intestine, and performed anastomosis, which took only about four minutes. Owing to the very low condition of the patient, I closed the abdomen with only one row of suture, and I resorted to intravenous saline injections on account of the very great loss of blood. The pulse after operation was very feeble and over 200. The same morning at about ten o'clock it was 180. The recovery was very prompt, the tube passing on the seventh day. I recall this case because I operated under the most unfavorable circumstances; in a room illuminated only by gas, with the poorest assistance, and among people terribly nervous for fear of police intervention in case of death. The patient was in such a low condition that I

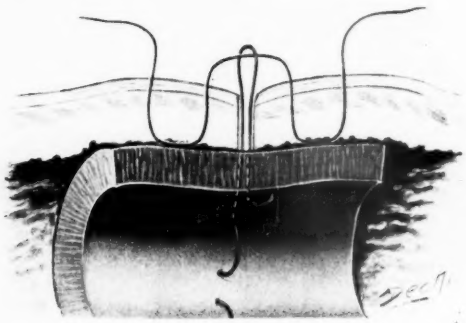


Fig. 15. Showing how mattress suture takes firm hold on the cut edges by passing through all coats and therefore through muscularis, which is the only coat that can hold stitching. By imagining thread tied, it will be evident that large serous surfaces are brought in close contact.

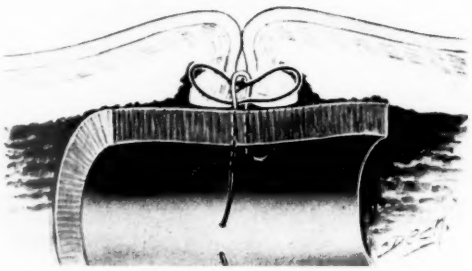


Fig. 16. Showing that when catgut loops have been pulled, so as to make them disappear from sight between the two cut edges of the gut, the thread used in the mattress suture will be in close contact with the rubber tube and the serous coats of the two cut edges are brought into close approximation, burying under serosas everything that came into contact with the intestinal cavity, such as thread and knots. The anastomosis takes place on top, where serosas have not been traumatized even by needles, or thread, or in any way damaged or infected.

am positive he would not have been able to stand any operation requiring considerable time.

Other interesting cases are the following:

Miss H. E. was operated on four years previously in Iowa for appendicitis, following which she had a severe attack of peritonitis. Two years ago she was brought from Iowa to Dr. Keenan, *in extremis*, suffering from acute intestinal obstruction. He operated upon her, was forced to resect the gut, and anastomosed it with a Murphy button, in order to get the patient off the table in minimum time. He found that there were adhesions everywhere, the bowels being adherent to the parietal and visceral peritoneum on all sides. The patient promptly recovered, but never passed the button, and refused to have it removed. She carried it until about a year ago when a slowly increasing ileus forced her to come to the hospital. In the oral end of the side-to-side anastomosis previously made was found the Murphy button. The end of the gut was dilated and thickened, and the opening between the two limbs would scarcely admit a lead pencil, consequently the entire anastomosis was excised and an end-to-end anastomosis was done by Soresi's method. One month later the patient was again operated upon, to remove a very large ovarian cyst, which it would have been unwise to touch at the previous operation. The anastomosis was very hard to discover, and in every way resembled those which were secured in the laboratory on normal intestine.

Fig. 17. Schematic view of mattress suture. This shows that the thread passing from one segment of the gut to the other is passed through a loop; it is immaterial whether it is passed under loop once or twice.

Case of Dr. Torek: Resection of small intestine for strangulated umbilical hernia. Umbilical hernia of three years standing. Patient was admitted to the German Hospital, in the afternoon, and was operated upon a few hours later, about thirty-two hours after the beginning of her strangulation. The hernia was very tense, the skin bluish red, and the suffering intense. An extensive gangrene of the small intestine was found, so that five feet of the intestine had to be resected. An end-to-end anastomosis by Soresi's method was made, after which the abdominal wall closed according to Blake's method. With the exception of some vomiting on the first and second days after the operation, the recovery was uninterrupted. There was no rise of temperature. A soapsuds enema given on the fifth day was effectual. Tube passed on the tenth day.

Carcinoma of sigmoid, necessitating resection of about 6 cm. of gut, anastomosis with Soresi's method, which took about seven minutes. Here an interesting accident happened. While pulling the catgut loops, the catgut broke. One strand of catgut was passed around the suture line and the result was very satisfactory. Recovery uneventful. Tube passed on the sixth day.

Mrs. J. S., 28 years. Two pregnancies, one abortion. Had been operated upon two years previously for tuberculosis peritonitis. She became constipated and suffered terrible pains in the abdomen. A mass was felt on the right side. On opening the abdominal cavity many adhesions were found between the different abdominal organs. In the right side the mass was found to be small intestine adhering to the ascending colon. The adhesions between colon and ileum were broken up, but

it was impossible to unravel the mass, so it was resected, and an anastomosis made. The operation was extremely difficult on account of large adhesions. A tube about 1 cm. in length was used, and three temporary stitches were inserted to hold it in place. Recovery uneventful, save slight rise of temperature the first four days. Tube passed on the eighth day.

In conclusion, I wish to advise again against using the method without having thoroughly mastered it, especially in emergency cases. I think that in emergency cases it will be found the most serviceable method now in use, because one can perform the operation even if all alone, and for this reason, I think that military surgeons will find it very useful on the battle field. The surgeon using the method, however, must be thoroughly familiar with it, in order to make quick and safe anastomosis under unfavorable circumstances and with very poor assistance, or none at all.

AN UNUSUAL BONE TUMOR OF THE FOOT

By E. H. BECKMAN, M. D., Rochester, Minnesota

THIS case is reported because of the unusual circumstance of finding a bony tumor lying in the hollow of the left foot which was not attached at any point to the bones of the foot. The patient's history is as follows:

Male, 24 years of age; occupation, car repairer. He gave an indefinite history of having had rheumatism of a mild grade on one or two occasions. Two years previously he noticed a small tumor about the size of a hazelnut lying toward the inner side of the plantar arch of the left foot. This was not movable or painful. The tumor had gradually increased in size until it completely filled the plantar arch of the foot. The patient's health remained good. He had never suffered any pain or inconvenience from the tumor except a slight tenderness when walking and the inconvenience of having the entire plantar arch filled up by the mass. He had not stopped work. The skin over the tumor was apparently normal, had never been reddened or sensitive, and the blood vessels were not dilated. The entire mass felt smooth and firm. The motion at the ankle joint was not interfered with.

The X-ray photograph showed the entire arch of the foot filled with a bony mass. (Fig. 1.) Its attachment to the bones of the foot could not be demonstrated, but from the position of the tumor it was thought to have originated from one of them.

At the operation an incision was made over the head of the first metatarsal along the inner side of the foot extending to the os calcis, and the skin and plantar fascia were dissected back from off this growth. The growth was then seen to

Fig. 1. X-ray No. 12388. Original radiograph. Region: left foot. Lateral view of plantar aspect. Note irregular outline bony tumor beneath plantar arch. At operation an encapsulated osteoma was found and removed. No bony attachment at any point.

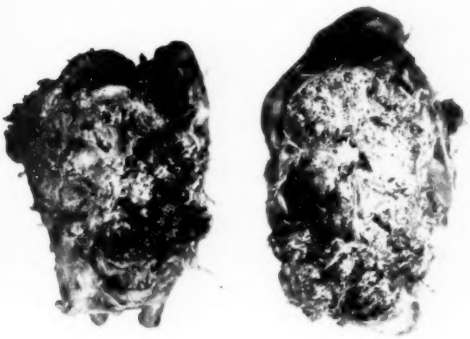


Fig. 2. The two halves of the tumor after removal, showing the bony structure of the growth.

be irregularly nodular with many wart-like projections which had pushed through the fascia. On account of the size of the tumor, it could not be exposed, and it was split through the center with a chisel and half of it removed. After obtaining more room in this way, the other half of the tumor was enucleated intact, and was found to rest upon the deep tendons of the foot, but no bare bone was exposed at any point.

The tumor consisted of bone and cartilage covered with a thick fibrous capsule, which, upon microscopic examination, showed no periosteum. The tumor weighed 160 grams, was irregularly oval, and measured 12x7x5 cm. (See Fig. 2.)

From the fact that this tumor was not attached at any point to the bones of the foot, that is was lying outside of the tendons, and because it did not have a periosteum, we believed at first that it was a sesamoid bone which, for some unknown reason, began to hypertrophy.

Sesamoid bones are not uncommonly found in the sole of the foot. Gray's *Anatomy* states that two small sesamoid bones are found in the tendons of the flexor brevis pollicis opposite the metatarso-phalangeal joint of the great toe, occasionally one in the metatarso-phalangeal joint of the second toe, the little toe, and, still more rarely, the third and fourth toes. A sesamoid bone is often found in the tendon of the peroneus longus, where it glides through the groove in the cuboid bone; one in the tibialis posticus opposite the inner head of the astragalus, and that one appears late in life in the tendon of the tibialis anticus opposite the smooth facet of the internal cuneiform bone.

Microscopically, the structure of this tumor is cancellated bone containing several areas of cartilage, It does not differ from the structure of many other new osseous growths developing from bone. We have not been able to determine its origin.

TINCTURE OF IODINE IN PREPARATION FOR LABOR CASES

By McDONALD WATKINS, M. D. Natchez, Mississippi
Obstetrician to Natchez Charity Hospital.

IN a casual review of current literature, I find that the new (old) antiseptic tincture of iodine is being put to many and various uses, and with marked success in most cases, but so far fail to note its use in confinement cases; that is, so far as preparation of patient is concerned, hence a few words of praise of its efficiency in this field. In my cases of labor during the past few months, when preparing for delivery I have made an application of the freshly prepared tincture of iodine, U. S. P., to find (with exception of mucous membrane), either at once, without previous preparation, as in emergency cases, or following bath and bichloride wash. After some hours, in cases under observation, I find that the entire external field is thus rendered aseptic, and this is specially useful in labor cases terminated with forceps attended by lacerations. These usually heal readily, seldom with any infection, healing by first intention. My usual routine, when called to case late, is to wash up rough, that is, simply wash my hands in soap and water, put gloves on to sterilize, clip long hair with scissors, thoroughly apply tincture of iodine to field, open lips of labia, sponge out with bichloride solution, wash up, put on gloves, and am then ready for examination, and must say that my results are gratifying. In special hurry cases, I let trained nurse apply iodine while I wash up. This method is applicable to abortions and curettage as well.

LITHOLAPAXY AS AN OFFICE OPERATION IN SELECTED CASES[1]

By H. A. FOWLER, M. D., Washington, D. C.

FROM a perusal of the literature relating to the treatment of vesical calculus it is abundantly evident that litholapaxy is the operation of choice in the great majority of cases. The operative mortality is much lower than for any cutting operation. Removal of the stone is as complete and certain; convalescence is much shorter, safer, less tedious, and is not accompanied by the disagreeable complications sometimes occurring after a cystotomy. These conclusions are well founded. They are based upon the extensive experience of many surgeons in all parts of the world and supported by statistics at once so abundant and so convincing as to leave no doubt as to their validity.

We all know, however, that at the present time, in this country at least, a cutting operation is most commonly resorted to for the removal of a vesical calculus. The reason for this is not difficult to understand. Cystotomy for stone, particularly suprapubic cystotomy, is a relatively simple operation. It presents no special difficulties and requires no special skill. The results are excellent in the majority of cases. The merest tyro in surgery can successfully open the bladder above the pubes and remove a stone. To successfully remove a calculus from the bladder by litholapaxy, however, requires considerable skill in urethral instrumentation and the manipulation of instruments within the bladder. It calls for special training obtained only by experience. Moreover, at the present time one would hardly consider himself thoroughly competent or feel fully justified in performing litholapaxy without being able to control his work with the cystoscope.

Cystotomy is simpler and easier for the surgeon; litholapaxy is more difficult for the surgeon, but safer and better for the patient in the majority of cases. It seems necessary, therefore, to qualify the statement that litholapaxy is the operation of choice in the majority of cases, by adding, provided the surgeon has equal skill in performing litholapaxy and cystotomy.

It is not the purpose of this paper to discuss the relative merits of these two operations in the treatment of stone in the bladder. I wish merely to summarize briefly my somewhat limited experience in performing the operation of litholapaxy in my office and to submit for discussion the proposition that in a certain number of selected cases of vesical calculus litholapaxy is not only the operation of choice, but it can be done in one's office with entire safety and satisfaction.

I wish to repeat, by way of emphasis and to avoid being misunderstood, that in selected cases only should litholapaxy be attempted in one's office. Obviously not every case of stone in the bladder is suitable for litholapaxy. It is quite as clear that every case in which this operation is indicated is not suitable for treatment in one's office. But with the exercise of proper care and judgment in the selection of cases, a considerable number of these patients can be operated upon in one's office with perfect safety and satisfaction.

Before referring to the conditions which should guide one in the proper selection of cases I wish to report the following:

Case 1. C. H. M., aged 64 years, consulted me in September, 1904, on account of "frequent urination and prostatic trouble."

He gave a history of having had five attacks of renal colic in the early eighties, each attack being so severe as to require morphia to control the pain. The pain began in the left loin, radiated to the scrotum and glans penis. The last attack was in the latter part of 1884. He never passed a stone with any of these attacks. He had absolutely no symptoms referable to the bladder until the latter part of 1901, except for an occasional pain in the glans penis which lasted only a very short time and passed away completely.

Onset of present symptoms began two years ago, when he first noticed "pain in the fundament and head of the penis." He then consulted a physician, who treated him daily with sounds for two months under the mistaken diagnosis of prostatic hypertrophy. After an interval of fifteen days the use of sounds was resumed and continued up to the time the patient came under observation, or a period of two years. Irrigation of the bladder with boric acid solution through a catheter was also done; this the patient learned to do himself. During the three months previous to his first visit he had washed out the bladder occasionally, and had been using sanmetto, salol, and urotropin constantly, as well as drinking large quantities of water. A number 32F. sound passed readily to the bladder. He had never had retention and had not noticed blood in his urine. He suffered with attacks of frequency and great urgency, with pain in the glans penis following urination. This pain is greatly increased by walking or jolting. The night before he consulted me he got up nine times to urinate. His chief trouble at the time he presented himself was pain in the glans penis, frequent urination, and pain in the bladder after urinating. He had been told his trouble was due to an enlargement of the prostate gland and that he needed an operation for the removal of

[1] Read before Washington Surgical Society, February 16, 1912. (See discussion on page 129)

this gland. It was for the purpose of confirming this diagnosis that he consulted me.

Examination. Urine cloudy, acid, specific gravity, 1015; contained a large amount of pus. Bacilli and cocci occurring in chains were seen in the stained smear. The prostate is flat, broad, smooth, and extends high up into the region of the vesicles. The secretion contains an abundance of pus.

Cystoscopy. A Porges catheter introduced with ease. There is no increase in urethral length. Forty-five cc. residual urine withdrawn. Bladder capacity 200 cc. On introducing the silk catheter a hard object was encountered in the bladder which was instantly recognized as probably a stone. The cystoscope, which passed easily, met the same object, which gave the characteristic click of a stone. The prostatic orifice was examined carefully and showed none of the changes seen in prostatic hypertrophy. Lying in a shallow *bas fond* formed by a transverse bar is a large, round, single, freely movable calculus with a white, rough, granular surface. It had the appearance of a phosphate of lime stone.

Litholapaxy under local anæsthesia was advised. It was our intention to do this in the office, but the patient preferred to go to the hospital. Accordingly the first crushing was done at the University hospital. The stone was readily grasped, but seemed to slip away from the grasp of the instrument. This manœuvre was repeated several times, apparently accomplishing little toward the reduction of the calculus. However, when the evacuator was introduced a very large amount of phosphatic debris was removed. The lithotrite was again introduced and the crushing repeated. Again a large amount of material was evacuated, but it was evident that a fragment still remained too large to come through the catheter.

This first seance was followed by a rise in temperature to 103°, which rapidly fell again to normal. There was practically no bleeding, and, what to me was still more surprising, very little soreness produced by the manipulations. Directly following the operation the patient was greatly relieved of his distressing symptoms of frequency, urgency, and pain. Cystoscopy performed a few days later revealed two fragments still remaining in the bladder. One of these was small enough to pass the urethra and was voided later.

Two weeks after the first operation he came to the office for the removal of the remaining fragment. A cystoscopy was first performed and the small fragment located. This was easily grasped by the lithotrite and readily crushed, only one or two crushings being necessary. After evacuating the debris the cystoscope was again immediately introduced and the bladder found to be free from stone. There was no bleeding from the crushing and evacuation to interfere with perfect inspection of the bladder with a plain Nitze examining cystoscope. Following the removal of the stone the symptoms produced by it completely disappeared. A cystoscopy performed subsequently showed the bladder free from stone and the cystitis. A note made six months later states that the patient feels "elegant," that he does not have to get up at night to urinate, and the intervals during the day are normal. This patient has remained under observation up to the present time and has never had any symptoms of recurrence. Eight months after the last operation he consulted me for what he called rheumatism of the back. It was then that sugar was first found in the urine. He then told me he had had sugar in the urine for a number of years. He was in the habit of measuring the specific gravity of his urine himself and when he found this above 1030 he restricted his diet and noted a reduction at once of the density to normal. Just before I found the sugar he had been on a chocolate ice cream soda debauch by way of celebrating his relief from his urinary troubles.

In this patient two separate crushings were necessary to remove a rather large, single, phosphatic calculus under local anæsthesia. The greater portion was removed at the first seance, only a small fragment remaining to be removed at the second operation. The first operation could have been performed just as satisfactorily and just as safely at the office. The patient afterward voluntarily remarked that his going to the hospital had been quite unnecessary.

Case 2. O. D. D., aged 37 years, was seen in consultation with Dr. V. B. Jackson at the University hospital in May, 1907. He presented the triad of symptoms usually associated with stone in the bladder, namely, frequency and urgency of urination, hæmaturia, and pain. There was considerable pus in the urine, which was infected. The bladder capacity was good. The cystoscope showed a single, ovoid calculus, freely movable, white in color with a rough, granular surface, Litholapaxy was advised and accepted. This was done under local anæsthesia with cocain. A large amount of phosphatic debris was removed with one introduction of the lithotrite. The first crushing was done in the hospital. The patient was told to come to my office in one week for a cystoscopic examination. This he failed to do because the relief from the symptoms which he had before the operation was so complete that he considered any further examination unnecessary. Nothing further was seen of this patient until October, 1907, when he came to my office with a return of the symptoms for which he had been operated upon in May. A cystoscopic examination revealed a calculus larger than the one removed five months before. There was no prostatic hypertrophy or other obstruction to urination. A second litholapaxy was performed in the office under cocain. The stone was completely removed with one introduction of the lithotrite. After evacuating the debris we examined the bladder at once with the cystoscope to make sure that no fragment remained. It seemed best to make sure this time that the bladder was free in view of the patient's failure to report for examination after the first operation. Although the stone was of considerable size (hickory nut) no trauma or bleeding occurred to interfere with a perfectly satisfactory cystoscopy before the patient got off the table.

It is probable that removal in this case was incomplete at the first operation and that a fragment left in the bladder served as the nucleus for the stone removed five months later. The fault rested entirely with the patient, who failed to appreciate the importance of a further examination and who disobeyed a strict injunction to return for that purpose.

Case 3. Mr. M., aged 63 years, a patient of Dr. Snowden of Alexandria, was suffering with the usual symptoms associated with stone in the bladder. At the time of his first visit he had been taking urotropin for some time. Instrumentation had been recently performed, and a litholapaxy unsuccessfully attempted. He came to my office accompanied by Drs. Snowden and Mitchell to have a litholapaxy done. Cystoscopy was first performed and three small stones about the size of marbles, evidently phosphatic, were found lying on and behind the trigone. A diagnosis of left pyonephrosis was also made by noting the escape of a thick purulent urine from the left ureteral orifice. Immediately after the cystoscopy the lithotrite was introduced and the stones readily grasped and crushed. It was evident during the evacuation that a small fragment too large to pass through the evacuator still remained. This could easily have been crushed by a second introduction of the lithotrite. The patient preferred to return in ten days for the completion of the work. At the second

seance, Dr. Snowden being present, cystoscopy was first performed and the fragment located. This was readily grasped, crushed, and removed. Immediately following this the cystoscope was again introduced and the bladder found to be entirely free from stone. These manipulations seemed to disturb the patient very little. After each seance he left the office unattended, boarded a street car, and went to his home in Alexandria. He suffered no inconvenience afterward further than the usual burning on urination experienced after any urethral instrumentation. It is interesting to note that in this patient, as in case one, there was marked relief of symptoms after the first crushing, although there was a fragment still remaining in the bladder.

There has been no recurrence of the vesical calculus although he has passed several stones since. Each time the passage of the stone has been associated with renal colic, the stones evidently forming in the pyonephrotic left kidney. I had occasion to see this man recently when he came to my office in company with Dr. Snowden on account of symptoms strongly suggesting another stone in the bladder. Cystoscopy showed that the bladder was free from stone, but very thick pus was escaping from the left ureter. A catheter was passed to the pelvis of this kidney and the pelvis washed out with argyrol solution. A subsequent report states that following this lavage the frequency, tenesmus and pain promptly subsided.

Case 4. Mr. W., aged 48 years, consulted me on account of marked frequency of urination accompanied by excruciating pain in the perineum and along the urethra. The pain was markedly increased by walking. He consulted me for the purpose of securing temporary relief until he could get away from his business to have an operation performed. His suffering was so intense as to make it impossible for him to continue with his work. Examination with the cystoscope showed a small irregular, dark brown calculus situated just within the bladder close to the urethral orifice. It was evidently composed of oxalate of lime. It was thought possible to remove this by simple evacuation. Accordingly, two days later under cocain anæsthesia, a large evacuating tube was introduced and an attempt made to pump out the stone, but it was too large to pass through the catheter and too hard to crush by the impact against the eye of the instrument. The lithotrite was then introduced and one closure of this sufficed to crush sufficiently to allow the fragments to pass through the evacuator. Cystoscopy performed at once before the patient left the table showed that complete removal had been accomplished. This patient has been under observation since this operation. No recurrence has taken place, and the relief of symptoms which was prompt has been permanent. This case illustrates in a striking way the fact that a very small calculus often causes most marked and distressing symptoms by crowding down into the region of the vesical orifice, where it produces a maximum amount of trauma and mechanical irritation.

Case 5. This case is similar to case 4. The patient, aged 35 years, came to the office one day and asked me to remove a stone from his bladder. He informed me that he had been cystoscoped and was told that he had a stone. He gave a rather indefinite history of vesical calculus extending over a period of three years, with acute symptoms developing only one month before I saw him. His chief complaint was frequent urination, twenty times a day and four to five times at night, with excruciating pain in the perineum and glans penis. This pain was particularly marked if he attempted to walk immediately after urination.

Examination showed a small rough calculus lying on the trigone just behind the internal sphincter. The color was grayish white with dark brown nodules, evidently an oxalate of lime with phosphatic incrustations. At a subsequent visit, after the patient had been taking urotropin, the evacuator was introduced and an attempt made to wash out the stone. At first the click of the stone against the eye of the catheter could be heard and seemed to indicate that the lithotrite would have to be used. By repeating the suctions of the pump several times, however, the stone finally broke and came out. Immediate cystoscopy revealed a bladder free from stone. This patient has been under observation ever since the operation. There has been no recurrence.

Case 6. This case is of more than ordinary interest, as it presents some very unusual features. The history of this patient has already been published in The Annals of Surgery, March, 1911. That part which is of particular interest in the present connection may be briefly summarized as follows:

The history of calculous disease covers a period of fifteen years. The onset was marked by symptoms referable to the kidney. He has passed a great many stones. Perineal section was performed for an impacted calculus in the urethra. Another stone was removed from the urethra by milking it forward to the meatus. Two litholapaxies were performed. The left kidney was removed for calculous pyonephrosis. Empyema of the left ureter developed as a result of the presence of a calculus which was demonstrated by the X-ray, but was not removed at the time of the left nephrectomy. Infection of the right kidney subsequently occurred, pyonephrosis developed, and anuria followed the plugging of the ureter. Nephrotomy of this remaining kidney was done, a greatly distended organ, filled with thick tenacious pus, was found. This man lived about three years after this last nephrotomy and died with symptoms of renal insufficiency. Following the last nephrotomy a stone developed in the bladder on two occasions and each time it was removed by litholapaxy at my office. One introduction of the lithotrite was sufficient to effect the reduction of the stone so that it could be evacuated readily. The calculus was small each time; the last time it had completely closed the urethral opening and acute complete retention resulted. The stone was easily pushed back into the bladder and then removed by crushing.

Case 7. This case is also of more than usual interest on account of the composition of the calculus — pure cystin. This case formed the basis of a paper read before the District Medical Society and published in Vol. 13 of the Johns Hopkins Hospital Reports. This patient has cystinuria and shows the tendency to the formation of cystin calculi, which is such a characteristic feature of this condition. In May, 1911, he came to my office with symptoms which he recognized as probably due to stone in the bladder. Cystoscopy confirmed his suspicions. A small oval calculus about the size of a small pea was seen resting behind the interureteral bar. It resembled in color and general appearance the large cystin calculus removed six years before by Dr. Young of Baltimore. From the cystoscopic examination it seemed likely that this small stone could be removed by simple evacuation without the necessity of crushing. The evacuator was introduced at once and the stone readily washed out. The patient expressed some surprise, when the stone was shown to him, that it had been removed so easily, as I had neglected to inform him of its presence until it had been removed.

He again returned some months later, stating that he feared another stone was present in the bladder. Meanwhile he had had no attacks of renal colic. The symptoms of frequency and pain in the glans penis were slight and

had been noted only very recently. Again the cystoscopic examination confirmed his diagnosis, and the stone was removed with the evacuator at the same sitting.

These two small stones are perfectly formed and are similar in every way, except size, to the large calculus removed in 1905. They undoubtedly formed in the kidney, passed to the bladder, and there produced the first symptoms leading to their detection and removal. The experience which this patient gained with his first calculus has made it possible for him to recognize early the presence of these last two calculi in the bladder, and caused him to seek relief early enough to make their removal a simple matter. It is altogether likely that a relatively short delay would have sufficed for the growth of these small stones to such a size as to have made simple evacuation impossible, and made the use of the lithotrite imperative. Remembering the tendency of these patients to the recurrence of renal and vesical calculi composed of cystin, and in view of his past history, it is not unlikely that he will contribute further to our growing collection of this interesting and rather unusual form of urinary calculi.

CASE 8. J. B. M., aged 46 years, was referred to me by Dr. Lawson. He stated that he did not have an ache or a pain, that there was no disturbance whatever in his urinary apparatus as far as he was aware, and that he never felt better in his life. Six weeks before, he had a typical attack of renal colic, followed by the passage of a calculus per urethram. During this attack he had suffered intensely. Since the attack he had been perfectly well and free from any disturbance whatever. He came for a general examination to find out if there was any likelihood of another attack similar to the one six weeks before, and if so, if something could not be done to prevent it.

The following history was obtained: Seven years ago he passed two small stones. He was taken with a sudden, severe pain in the right loin. He was nauseated, but did not vomit. Three or four hours later he passed the two stones. Since this attack he has noticed occasionally some frequency of urination, pain along the urethra, and has been, as he expressed it, subject to cold. By this he meant that exposure to cold often precipitates an attack of frequent urination.

Five or six months ago he was seized with a sudden, severe pain in the right loin which passed off immediately. The pain was so severe as to almost throw him to the floor. There was no hæmaturia noticed following the attack, and no disturbance in urination. It was four months later that he had the last attack of kidney colic, followed by the passage of a stone the size of a lima bean. Since this attack six weeks ago, he has felt normal in every way, and states he has not had to be so careful about exposure to cold as heretofore.

Examination. The patient appears to be in perfect health. He is active, vivacious, and not greatly concerned about himself. He seeks an examination merely as a matter of precaution.

External genitalia normal. The urine is very light and clear like water, free from shreds, acid, specific gravity 1018. There is a trace of albumin by both the heat and nitric acid tests. A centrifuged specimen shows a few red cells, a few leucocytes, and cylindroids. The prostate is normal, the examination is not painful. Two days later the findings were similar; the urine was perfectly clear. It was then suggested that it would be interesting to see what changes, if any, had been produced in the ureteral opening by the passage of the calculi. To this suggestion he readily assented. It was at the third visit that the urine first showed macroscopic changes suggesting some trouble in the urinary apparatus. It was slightly turbid, due chiefly to pus and some blood. There were, however no symptoms.

On introducing a silk catheter we were amazed to feel the tip impinge upon a hard object readily recognized as a stone. On attempting to withdraw the catheter some difficulty was experienced, as the stone was drawn down toward the vesical orifice and threatened to prevent the withdrawal of the catheter. The cystoscope showed a large, round, single, freely movable, dark-brown, mulberry calculus lying over the edge of the trigone and behind the interureteral bar, covering the right ureteral opening. Bladder mucosa slightly reddened over the base but no general cystitis present. Bladder capacity large. Lithotapaxy at the office was proposed and accepted. Under cocain a large amount of debris of pure oxalate of lime was removed. The calculus was very hard and crushing therefore difficult and tedious. The bladder seemed wonderfully insensitive, so the patient suffered little. The lithotrite was introduced twice and about half the stone removed. After the seance he boarded a street car and rode to his home in Kensington, a distance of seven miles. There was no febrile reaction following this first seance, but he remained in bed two days on account of the irritation produced by the passage of some fragments left in the bladder.

Two weeks later he returned for the removal of the remainder of the stone. At this time there was no disturbance in urination whatever. On attempting to introduce a silk catheter for the purpose of washing out the bladder and depositing cocain, it met with an impassable obstruction at the vesical outlet. The fragment of stone still remaining in the bladder had become wedged down into the orifice of the prostatic urethra, effectually closing it to the passage of a flexible instrument. A silver catheter was then used, the tip of the catheter was passed under the stone in such a way as to lift it up into the bladder, and free the orifice. A silk catheter was then easily introduced. During this manipulation a slight trauma was produced as evidenced by the appearance of a little blood at the meatus. It was therefore impossible to cocainize the urethra for fear of rapid absorption. Only a small amount of cocain was instilled into the bladder through the catheter. However, with this very meager amount of anæsthesia we proceeded with the crushing and succeeded in removing the remainder of the stone without causing the patient very much pain. It must be said, however, that this man was an ideal patient for this operation.

There was no rise in temperature following either seance, and except for the usual irritation incident to any urethral instrumentation, the patient was quite comfortable on the following day. The stone in this case was a pure oxalate of lime of the mulberry type, and about the size of an English walnut, very hard, and required considerable force to crush it. The operation was necessarily somewhat prolonged on account of the hardness of the stone and the fact we were working with a local anæsthetic. However, the patient expressed himself as greatly pleased and surprised at the absence of marked pain and suffering. A subsequent cystoscopy, two weeks later, proved that the stone had been completely removed. At this time the urine was clear and free from infection. The right ureteral orifice was now seen to be very irregular and jagged, the result of trauma from the recent passage of a large calculus.

There are several interesting points in connection with this case. Perhaps the most striking fact was the complete absence of symptoms with such a large rough calculus in the bladder. The finding of this stone was totally unexpected; its presence was not suspected; and it was discovered only in the course of a routine examination. This absence of symptoms is explained in part by the absence

of infection. One would think, however, that the trauma produced would give rise to marked irritation. That it did not do so can be explained only by assuming that in this case the bladder was markedly insensitive. And this is borne out by the freedom from suffering enjoyed during a somewhat prolonged operation under almost no anæsthetic during the second seance. This patient has been under observation since the operation. The urine has remained free from pus and infection. An X-ray of the kidneys and ureters was negative.

CASE 9. G. B., aged 70 years, was seen first in 1906, in consultation with Drs. Perry and Balloch. At that time he was suffering with intense pain in the perineum, radiating along the left side of the penis, frequent urination, and a small stream. A stricture of small caliber was found in the bulbous urethra. Lodged in a pouch behind the stricture was a small, round, smooth stone the size of a small marble. The stricture was dilated and the stone removed through a perineal opening. Subsequently the stricture was dilated to No. 35 F with a Kollmann dilator. He was warned to return for the occasional passage of instruments in order to keep the urethra well dilated. This he failed to do.

He next came under observation in January, 1912, complaining of frequent urination, a small stream, and pain in the perineum. The old stricture had recontracted to filiform size. After dilating this sufficiently to pass instruments to the bladder a stone could be felt in the bladder with flexible instruments. The stricture was gradually dilated to No. 35 on the Kollmann dialtor. Cystoscopy revealed a soft, flat, phosphatic stone lying on the left side of the trigone. There was general cystitis, and the urine was very foul.

After preliminary treatment for a short time, a litholapaxy was performed at the office. Considerable difficulty was experienced at first in grasping the stone, as it was lying so close to the urethral orifice. We succeeded finally in crushing and removing the debris in one sitting. There was no febrile reaction; the patient left the office unattended, and rode to his home on a street car. Cystoscopy, performed at a subsequent visit, showed the bladder free from stone. There was no enlargement of the prostate. It is probable that had the patient heeded our advice and kept his stricture delated no stone would have formed in his bladder.

SUMMARY

We have operated fifteen times upon nine patients. In three patients two crushings each, separated by an interval of a week or ten days, were necessary for the complete removal of the calculus. In one of these, three stones were present; in the other two the calculus was single: in one a large phosphatic stone; in the other a large oxalate of limestone. In the remaining operations the stone was removed in one seance. In all of these latter cases the stone was relatively small, the largest being about the size of a hickory nut. The operations were all done under local anæsthesia (cocain.) Only once was a postoperative elevation of temperature noted, the so-called urethral chill, which promptly subsided in a few hours. In each case the complete removal of the calculus was made certain by subsequent cystoscopy. In nearly every case this cystoscopic examination was made immediately upon the completion of the operation. Particular stress is laid on this point, as it shows that the trauma to the bladder and posterior urethra was not such as to produce sufficient hæmorrhage to interfere with a perfectly satisfactory cystoscopy. We emphasize this point for the reason that some descriptions of this operation which we have heard would lead one to suppose that grave trauma of the bladder is scarcely to be avoided and is, indeed, quite the usual result.

Much of one's success in operating upon these cases in the office will depend upon the proper selection of cases. In selecting suitable cases one is limited at once in their choice to those in which the operation can be done under local anæsthesia. Local anæsthesia is perfectly satisfactory for this work in a considerable number of patients, for example, where the stone or stones are not too large, the working capacity of the bladder is ample, at least 150 cc. and the patient bears instrumentation well. A preliminary cystoscopy will give one the desired information on this last point, an examination which should be made in every case.

In the presence of marked infection with the accompanying bladder changes together with an irritable bladder, litholapaxy, if performed at all, should be done in the hospital. Cases with a large calculus are not suitable for local anæsthesia, and therefore had better be operated upon in the hospital under a general anæsthetic.

In general, then, litholapaxy can be performed easily and safely in one's office in those cases in which the operation can be done under local anæsthesia, particularly in patients with a small or moderately large calculus, and an ample bladder capacity. Such a patient will usually bear instrumentation well.

It is to be remembered that when working under a local anæsthetic one is bound to be more gentle and more careful in manipulating the lithotrite. There is much less likelihood of producing trauma under such circumstances than when one is operating under general anæsthesia. It is unnecessary to traumatize the bladder in performing a litholapaxy in the class of cases we are now discussing. And when considerable trauma is produced it is the result either of carelessness or inexperience and cannot, therefore, be urged as an objection to this operation.

The introduction of the lithotrite and the evacuating catheter is no more difficult than the introduction of the cystoscope and the steel sound. The manipulation of the lithotrite in

seizing and crushing a calculus, if one is careful and gentle, will produce no trauma to the bladder wall. And when no trauma is produced there will generally be no postoperative reaction. The operation becomes quite as simple so far as danger to the patient is concerned, as any other intravesical manipulation, such as cystoscopy and ureteral catheterization.

Our experience in this small series shows that in suitable cases one or more stones can be removed from the bladder under cocain anæsthesia in one's office with ease and without danger to the patient. This fact was established long ago by Chismore of San Francisco, whose experience with the operation of litholapaxy in his office was extensive. It has been confirmed since by the experience of a few surgeons who employ this procedure.

SOME PHASES IN THE SURGICAL TREATMENT OF GASTRIC ULCER[1]

By W. D. HAINES, M. D., Cincinnati, Ohio

ONE of the principal phases in the surgical treatment of gastric ulcer is the adoption of some plan which will effectively relieve the distress of the patient, free him from the handicap of ulcer symptoms in his wage-earning capacity and diminish his chances of becoming a subject of cancer of the stomach.

In 1881, Wolfer devised and successfully performed an operation for the relief of pyloric insufficiency induced by the presence of a prepyloric ulcer. Since that time Mikulicz, Moynihan, Mayo, Finney and others have rounded out the technic of a number of operations which deal directly with some phase of gastric and duodenal ulcer. In passing through the formative period these operations were frequently performed in the absence of well grounded reasons, indeed gastro-jejunostomy or some other type of drainage operation has been regarded by many as a panacea for all sorts of gastric disturbances ranging from infantile colic to ulcer hæmorrhages.

It is to this misconception of the application of the principles of these operations that much unmerited reproach and abuse have been heaped upon stomach surgery and chagrin and miscarriage have not infrequently confronted the conscientious though misguided surgeon in his endeavors to relieve ulcer symptoms.

In a paper read before the Surgical Section of the Ohio State Medical Association in 1904, I discussed the Rodman operation for removal of the ulcer bearing area as being ideal in the surgical treatment of gastric ulcer but a prohibitive mortality caused me to abandon the operation for the more simple procedure, gastro-jejunostomy.

Experience has shown that for one hundred times the stomach cries "Wolf"! "Wolf"!! the lupine is present in but few instances; cholecystitis, ileus, septic peritonitis, appendeceal inflammations, disease of the pancreas and numerous other pathological lesions within and without the abdominal cavity have presented the flamboyant symptoms of gastric ulcer and a certain degree of temporary relief has followed in some of the cases submitted to operations upon the stomach, fortunately without further bad results other than loss of time and means on the part of the patient and keen disappointment on the part of the surgeon.

While it has been definitely shown that mechanical lesions of the stomach yield readily to mechanical means in their treatment, this only serves to accentuate the supreme importance of assurance that the symptoms present are dependent upon ulcer.

The classical symptoms of gastric ulcer — pain, vomiting, blood, when present, serve to establish the diagnosis to-day as in the past with this difference, each symptom is more carefully scrutinized and the process of reasoning by induction has gradually forced a more rigid process of exclusion in formulating an opinion.

The laboratory method for securing stomach secretions for quantitative analysis is manifestly unfair. The ordinary test meal is an artificial procedure from beginning to end and deductions based upon this source of information are of uncertain value and not infrequently at variance with the real conditions found at operation.

The influence of the mind has been shown by Pawlow to be the chief factor in the production of stomach secretions. He demonstrated this proposition by making numerous fistulæ in the

[1] Read before the Western Surgical Association, Kansas City, Missouri, December 18 and 19, 1911, and also before West End Medical Association, December 12, 1911

gastro-intestinal tract after short-circuiting the food by division of the œsophagus. On feeding the animal an abundance of gastric juice was formed although no food entered the stomach; he further demonstrated that division or clamping of the vagi totally arrested the formation of gastric juice.

Among the many plain every-day facts annoted by this astute observer, one recites that dogs rendered angry before feeding will retain the food in an undigested state for a long time; on this basis he formulated the axiom that acid opens the pylorus and acid closes the pylorus.

These few citations are introduced to confirm the growing tendency upon the part of the surgeon to the belief that a true concept of the chemical constituents of the gastric juice in a given case may only be obtained by examination of stomach contents taken at a time when the patient is in a relatively natural state in mind, time of feeding, character and amount of food taken.

As experience broadens, we are occasionally confronted with recurrence of ulcer symptoms after a well performed drainage operation in cases presenting all of the clinical manifestations of faulty drainage prior to operation and in which an active pathological lesion was demonstrated at the time of operation.

The postoperative history of such cases differs in no way from the usual happy result obtained in the well selected case of gastric ulcer during the stay in the hospital. The patient expresses himself as feeling well, relishes his food and suffers no discomfort after eating; he increases in weight for a month or two, at which time he has a recurrence of some of his former symptoms. The mild symptoms are soon replaced by more severe symptoms, and in a short space of time the patient, thoroughly discouraged, returns for further advice.

In a limited experience with the recurrence of symptoms after operation for gastric ulcer, I am wholly unable to distinguish at the time of operation the type of ulcer which will be cured and remain cured by a gastro-jejunostomy from the type to which this operation will afford but brief relief from ulcer symptoms.

Postoperative peptic ulcer occurring in the region of stoma has no place in the present consideration. We are here speaking of the ulcer found at the time of operation, the raw surface which persists despite operation and temporary abatement of symptoms.

In one instance, in which ulcer symptoms returned a short time after operation, we found at the second operation a deep perforating ulcer which involved the deeper muscular fibres of the stomach wall; the ulcer was located in the pyloric antrum and was seemingly on the eve of perforating. The stoma made six months previously was ample and there were no perigastric adhesions at the time of the second operation; the distress of the patient, however, was greater than before the first operation.

Complete relief was obtained in this case by encircling the ulcer with a purse-string suture, pushing a blunt instrument through the crater and covering the site with a double row of seromuscular sutures.

There was little, if any, change in the physical appearance of this ulcer, save at its very crater, which appeared to be on the verge of giving way. The plastic exudate observed at the time of the first operation appeared whiter at the time of the second operation, but there had been no increase in the amount. From a mechanical standpoint the gastro-jejunostomy had been a success in this case but from a curative standpoint it had been an abject failure.

The subsequent course of this case practically excludes malignant degeneration as a causative factor in the failure of this ulcer to heal. Three years have passed since the last operation; the patient is in excellent physical condition.

The frequency with which carcinoma of the stomach is preceded by ulcer offers a ready explanation for the non-healing of some ulcer cases, but I am convinced from personal experience and conversation with other surgeons that some other explanation must be sought for a certain number of failures.

The "precancerous stage" is at present occupying a rather prominent position in the scheme of surgical diagnosis.

Hendly maintains that invasion of other tissues through the blood and lymph streams is preceded by an insidious pathological process which renders the tissues vulnerable to the slowly growing cancer cells. Tissues become the site of malignant change which, in the absence of this insidious process, might have held in leash the further progress of cell invasion; that is to say, normally resistant tissue is invulnerable to cancer cell invasion. He calls the process "permeation" and says that it is operative regardless of the direction of the flow of the blood and lymph streams. He does not fix a time limit as to how long the permeation must continue ere cell invasion becomes possible, nor does he tell us how we may recognize this insidious process, this precancerous stage of the disease. He has,

however, introduced a new and highly probable hypothesis into the cancer problem, whose elucidation may render invaluable aid in the management and cure of this dread malady.

Just what proportion of the gastric ulcer cases remain unhealed after gastro-jejunostomy, has not been fully determined but the fact that some of the cases persist in spite of operation and the equally well established fact that ulcer long subjected to the irritating influence of stomach secretions strongly tends toward malignancy has induced surgeons to institute more radical measures in the operative treatment of gastric ulcer.

Removal of the ulcer bearing area (Rodman), while in many respects an ideal operation, carries a prohibitive mortality, and has not been generally accepted by the profession as the best method for dealing with gastric ulcer. Excision of the individual ulcer in conjunction with gastro-duodenostomy or gastro-jejunostomy is an operation which is rapidly gaining favor with American surgeons.

Excision has many commendable features; it is applicable to a solitary ulcer situated in any part of the stomach wall; it adds very little to the risk, and the end results are more satisfactory. Due weight should be given the physical condition of the individual case before determining upon the type of operation to be performed.

Some of these ulcer cases are much reduced in weight and their powers of resistance are greatly enfeebled in consequence of long physical suffering, poor nourishment and mental depression. This class of cases taxes the ingenuity of the experienced in their successful management and contribute a large percentage to the death list in the surgical treatment of gastric ulcer.

The rapidity with which some of these half-starved ulcer cases recuperate after efficient stomach drainage is established has enabled us to convert, in a short space of time, an almost hopeless risk into a comparatively safe risk for a secondary or causal operation, excision or resection of the ulcer-bearing area. I have elsewhere called attention to the inter-relationship of the functions of the stomach, duodenum, gall-bladder, and pancreas. The intimacy of this relationship becomes more manifest when one of this group of organs becomes the seat of a pathological lesion.

Rarely indeed have I seen a case of chronic gastric ulcer which did not show some degree of gall-bladder or pancreatic involvement. With a view of relieving this phase of gastric ulcer pathology, Dr. S. H. Smith and myself have, for the past two and a half years, been draining the gall-bladder in connection with the work on the stomach.

The immediate results have been very gratifying and the after history of those cases which we have been able to trace have permanent benefits derived from this additional procedure, such as to warrant further continuance of this practice.

TRANSACTIONS OF SOCIETIES

WASHINGTON SURGICAL SOCIETY

REGULAR MEETING, HELD FEBRUARY 16, 1912, THE PRESIDENT, DR. CARR, IN THE CHAIR

CASE REPORTS

DR. VAUGHAN reported a case of osteosarcoma of the anterior surface of the lower left femur in a colored woman of 26. Had been in previous good health, except rheumatism in elbows and knees. First noticed a swelling in left knee six weeks prior. The joint was not involved, and there seemed to be no metastases. Amputation was refused. Incision was made and the growth chiselled off. There was profuse hemorrhage and the operation had to be hurried. Cystic cavities were found in the tumor. It was probably a small round-celled sarcoma and the prognosis, therefore, very bad. He mentioned the rapid progress in melanotic sarcoma, having had four cases, only one of which lived over a year; he had operated and also used Coley's fluid in these cases without avail.

DR. MAGRUDER mentioned a case thought at first to be tuberculosis of the angle of the scapula; in five weeks the whole scapula was involved by a small round-celled sarcoma.

DR. SHANDS thinks the question of prognosis is most interesting. Sarcoma is often confused with tubercular joints. He mentioned a case of a lady of 50 in whom a fracture of the upper third of the thigh was apparently cured, but in a few months pain and what seemed to be enlarged callus developed; the tumor grew rapidly and the case died 10 months later. He thinks the prognosis in sarcoma generally gloomy.

DR. SNYDER mentioned a case recently seen of pelvic sarcoma, showing induration and bagginess in the groin. A thrill was transmitted from the iliac vessels and there was a question as to diagnosis. On incision, a soft friable mass was found. Alarming hæmorrhage was encountered, only controlled by vigorous packing. Dr. Vaughan said early operation was imperative in these cases, and that prognosis is good except in the more malignant varieties with early metastases. He had had three cases that survived beyond the 3-year limit. Some cases show remarkable persistency in recurring. One case had had a sarcoma for 25 years with several operations. Da Costa mentions a case operated on by Gross 22 times and cured. The interesting practical point is whether to excise or amputate and this depends, of course, on the variety of growth. In some cases, excision is quite sufficient.

DR. SNYDER showed an X-ray of fracture in upper third of humerus in a colored man. The case was interesting because of the impossibility of reduction on account of interposed muscle. It was necessary to incise, remove the interposed tissue and wire the bone; — the result was good.

DR. HOOE mentioned a case of presumed appendicitis, but the removed appendix seemed normal until, on opening, a small piece of coal was discovered. Other peculiar bodies in the appendix were mentioned by members: DR. VAUGHAN had found a round worm; DR. BALLOCH, a pin causing perforation and abscess in the mesentery of the colon; DR. STONE had found a grape seed 15 years ago; DR. W. P. CARR had found a piece of crab bone.

DR. FOWLER read the paper of the evening, "Litholapaxy as an Office Operation in Selected Cases." (See page 121).

The discussion was opened by DR. HAGNER, who said there was no question that litholapaxy is the operation of choice in proper cases; a sufficient bladder capacity is, of course, necessary and encysted stones are difficult to remove in this way. He mentioned the case of a feeble man of 86, who had a stone 3 cm. in diameter but encysted with only a small area showing. There was prostatic enlargement and he was unwilling to open the bladder unless a prostatectomy could be done. Under nitrous oxide and oxygen the stone was pushed up by a finger into the rectum, crushed and removed. An open operation in this case would have left a fistula. He differs from Dr. Fowler only in one thing — that is, the advisability of office operations. He knows that many men do fairly extensive operations in the office, but he does not believe in it. Of course it saves the patient some time and a small hospital

bill, but the cost of hospital care for these cases is slight. If a patient were to have a chill after leaving the office or receive a fall or some injury the surgeon would be blamed. He recalled a case where the patient had evidently become dizzy after prostatic massage and fallen from a car and cut his head; he was glad he had not done litholapaxy on this man.

Dr. Vaughan agrees that litholapaxy is the operation of choice in selected cases, but is inclined to agree with Dr. Hagner as to the advisability of operating in a hospital where the margin of safety is greater. He showed a mulberry stone carried by a patient for 10 years, where the bladder was too small to permit crushing the stone, which was removed suprapubically.

Dr. Lehr had done two cases easily in his office, though one case suffered some nausea afterward, fortunately before he started home.

Dr. Snyder said vesical stone was surprisingly frequent in general practice,—he had seen mention of a New York surgeon who had seen 99 cases.

Dr. Hooe said there was no doubt that certain localities favored the formation of stone. Dr. Kinyoun had seen in one Chinese hospital an enormous number of stones, the condition being very common in certain districts of China.

Dr. Fowler said, in closing, that stone is relatively infrequent in the United States and is especially rare in the colored race. He had expected Dr. Hagner's criticism of the paper — as a matter of fact the idea of presenting the paper had arisen from a friendly discussion of the subject. If we rule out all office procedures because of the things which may possibly happen, there will be few left as perfectly safe. Dr. W. P. Carr had mentioned a case of death from urethral sounding; does that mean we should not pass sounds in our office? It is a question of the relative degree of danger. As he said in the beginning the cases should be selected, the urethral tolerance studied and established; naturally cases should not be operated on during their first visit to the surgeon's office.

CHICAGO SURGICAL SOCIETY

Regular Meeting Held February 2, 1912, with the President, Dr. Frederic A. Besley, in the Chair

Dr. William M. Harsha and Dr. Joseph Eisenstaedt contributed a joint paper entitled "Bilateral Resection of the Jaw for Prognathism, with Report of a Case." (See page 51).

DISCUSSION

Dr. Thomas L. Gilmer: The result, as indicated by the illustrations, is most excellent, and Dr. Harsha and Dr. Eisenstaedt are to be congratulated. Prognathism, to a limited degree, is not uncommon, but is exceptional to the extent indicated in the case reported by Drs. Harsha and Eisenstadt. Inheritance doubtless plays a far greater role as a causative factor in elongated jaws than do pathological conditions of the tonsils and other parts. Experience leads me to believe that a child with prognathic lower jaw has almost always as an antecedent, a parent with a similar jaw; indeed, I do not recall a single instance in which this was not the case. I have in mind at this time a child two years old, whose lower deciduous teeth are set the full thickness of both the upper and lower teeth forward of normal occlusion. In this case the father has a jaw with quite as much prognathism as the one shown tonight. Orthodontic treatment will be employed in the case of the child indicated, with the hope and belief that the deformity will be corrected while the bone is yet pliant. If the correction of prognathism of the lower is attempted by orthodontic appliances it should be commenced before the eruption of the permanent teeth.

I had the privilege of seeing Dr. Blair's case, referred to in one of the papers. The result indicated a great improvement. Dr. Hullien's case is one of history. It was done before the days of aseptic surgery, therefore it is not surprising that the results were not good. I have never performed the operation, though would have no hesitancy in attempting it, should a favorable case present. In the cutting of the bone, it seems to me, a better and smoother result might have been obtained had the surgical engine with a circular saw been employed instead of the rongeur or other bone-cutting forceps.

Dr. H. A. Potts: The case before you demonstrates very clearly the advantage of co-operation between the surgeon and the oral surgeon, or the

dentist, in handling these cases. In the first place, the surgeon is prone to call a result good when he gets a union of the mandible in fractures, or in such cases as this. The real result, from the standpoint of the patient, is the occlusion of the teeth, and it is only by this co-operation that such a result can be brought about.

I wish also to emphasize the importance of family physicians being familiar with the first permanent teeth, the molars which come in before the child has lost any of the teeth, known as the first molar or sixth-year molar. It is these teeth which mold the countenance and establish the occlusion. In regard to the opposite condition or agnathism, I might mention a case which I saw in connection with Professor Garré, of Bonn. The patient was a boy, fourteen years of age, in whom the lower jaw was very small. He was an orphan, and nobody was paying any attention to him. At night, on account of pressure, he would wake up almost choked to death, respiration being very much interfered with. The proposed operation was sawing through the lower jaw at the symphysis. This, of course, would have left the two fragments of the jaw entirely loose, and it was the idea to place a piece of ivory in between, to separate the parts. In this case a splint was manufactured, from a cast of the teeth. Separating the jaws on the articulator, and being governed by the upper teeth, the splint was made and the occlusion which we wished the teeth to have was brought about. This splint was heavily re-enforced by a bar across here (indicating on blackboard), and the fragments spread apart almost an inch, enough to entirely relieve him of the difficulty in respiration. This splint was of German silver and cemented on the teeth. The boy was allowed to use his jaws to chew soft food and, at the same time, it retained the fragments, and after the wound in the mouth had healed, a piece of resected rib or bone from some other part of the body was transplanted from an external incision, avoiding danger of infection from the mouth. In many operations on the jaw, or, in fact, in any operation in which the continuity of the lower jaw is interfered with, it is much better for everybody concerned if a splint can be made and be put on at the time of the operation to maintain the continuity of the jaw while the parts are healing.

Dr. Frederick B. Noyes was asked to participate in the discussion. He said: The position in which the segment should be made has been a matter that has attracted a good deal of attention in these operations. There have been at least three — probably more — positions suggested. For many reasons the position in which this segment was made seems to be admirable, and has advantages over any of the other positions that have been used.

Dr. Harsha (closing the discussion on his part): In regard to the method of cutting away the jaw, we tried, first, the Gigli saw, and broke it; I resorted to bone-cutting instruments. It was easy to cut away the bone with bone-cutting forceps and the rongeur, and when we got to the inferior dental nerve we put a thread around it, held it aside, and cut out the bit of bone. I chipped out a piece of bone on either side like that (indicating on blackboard) so as to prevent the nerve from being caught between the edges of the bone.

As to taking out a V-shaped piece, which was referred to by Dr. Graham, unless one should go above the point of entrance of the nerve into the jaw, he would have some difficulty because he could not shorten the whole jaw without taking it clear through. We figured on that, and if you will notice the X-ray plate, you will see how far the chin protrudes, and to have taken out a V-shaped piece would hardly have shortened it enough.

As to Dr. Babcock's operation, which has been described in a dental journal, and referred to here, I will say that Dr. Babcock takes out a piece from the ramus, and has had good results. But in our case there was plenty of room in front of the angle. This shows the shape of it (Figs. 6 and 7), and when it came together it gave a more normal angle to the jaw, and, at the same time, secured a better occlusion. (Fig. 8.)

An unfortunate thing about this case was that we did not and could not have time beforehand to prepare the upper teeth, and we did not have the opportunity to maintain the apposition because he left the city. The operation was made without entering the mouth at any point. There was not a drop of blood in the mouth, and we could protect the outside from infection, and if the man had remained a little longer we could have restored the articular planes of the teeth before bony union resulted.

Dr. Eisenstaedt (closing the discussion): There are two considerations concerning this subject which I wish to discuss a little in detail:

1. The success obtained in operations previously performed for this kind of malocclusion and deformity.

2. We have substantiated and concluded in our method of operating by geometrical calculation and by control of muscular pressure pres-

ent, the principal facts to be considered in this bilateral resection.

1. (*a*) In Dr. Babcock's methods published in "Items of Interest" for June, 1910, no consideration has been given to the amount of mesio-occlusion present, in terms of inches or mm., with reference to the relation of the upper and lower six-year molars, and the position of the upper and lower cuspid teeth, which are the guide and key to normal occlusion and the basis of diagnosticating malocclusion.

(*b*) With these facts of normal occlusion disregarded, Dr. Babcock's methods likewise cannot attempt to restore a normal mandibular inclination of 90°, or the approximate relation of the ramus to the body of the mandible, present in an adult. And the disregard of this anatomical fact has resulted in the absence of the angular prominence of the jaw, whereby character and facial expression may be given to the profile. And in this connection, I wish to add that where a difference between the occlusal surfaces of the upper and lower teeth exists when same are in occlusion, as was present in our case, it is necessary to determine this difference, approximately, by a protractor to give the sufficient inclination to the fragments as later described and shown in Figure 16 (see page 58) to restore the mandibular angle to an inclination of about 90°.

(*c*) Furthermore, in Dr. Babcock's method the disregard of fragment approximation led us to believe that his difficulty in overcoming muscular pressure from the masticatory muscles was due to the failure of complete bone union in the gap left to be filled with bone by the bridged periosteum.

(*d*) Likewise mobility of the body fragment was present, after the immobilizing appliances were removed, as Dr. Babcock states the patient found mastication wearisome and would not submit to another operation.

2. The calculation of the form of bone segments to be removed from the amount of mesio-occlusion, together with Dr. Harsha's surgical technique and the region wherein the resection was made, I believe to be the contributing factors attending our degree of success obtained. And to confirm the calculation used at the time of the operation, I wish to offer the geometrical solution, determined in Fig. 16. (See page 58.)

Lines A, B, A′ and B′ represent the basic points used in diagnosticating the variations of malocclusion, according to Angle's Classification, mentioned in paper before. Lines C and D, representing the planes of occlusal contact of the upper and lower molars and bicuspids, have a difference of inclination which measured 15°, by a protractor. See also Fig. 10, showing inclined planes of tooth cusps with teeth parallel.

Using the plane of the upper teeth, line "C," as a guide and realizing that the inclination of the ramus in relation to the body of the mandible is approximately a right angle, the line "G" was drawn parallel to line B and perpendicular to line "C"; this I believe to be the inclination to be given to the margin of the ramal fragment. Likewise according to the same facts line "E" was drawn perpendicular to line D and ¾ of an inch posterior and parallel to line "A," equaling the amount of mesial or anterior protrusion. From line "E" was drawn line "F," parallel to former and ¼″ posterior, to represent the marginal inclination of the body fragment; and this was calculated to be sufficiently distant from the peridental membrane of the distal roots of the lower second molars to prevent pressure from callus which will form around the silver wires anchored to approximate the fragments. See Fig. 15.

The dotted line "H" in Fig. 8 represents the upper border of the segment to be ¾ of an inch long. Thus by shading the space between lines G and F which pass through the angle of this mandible, we find "K" to represent the form of segment to be resected.

In the operation, a segment was removed as shown in Fig. 7. Here we have an isoceles triangle with its apex removed, wherein two angles are equal with the converging sides equally inclined; this measured approximately 7½°, and together equal 15°, or the difference in the planes between the upper and lower teeth as shown in Fig. 8. And therefore, practically, the amount of inclination given the fragments in the operation was correct; for at that time we were not able to calculate other than from our mind's eye.

Muscular tension on the body fragment was overcome when raising the periosteum beneath the masseter, necessary and incidental to the sub-periosteal resection.

Finally, I wish to conclude with this belief, that the region for performing a bilateral resection is at the junction of the ramus and the body of the mandible, or the angle of the jaw as determined from a radiograph.

Dr. Emanuel Friend read a paper entitled, "Mesenteric Chyle Cysts." (See page 1.)

DISCUSSION

Dr. L. L. McArthur: The interest in these cases of chyle cysts to the surgeon lies, first, in the

nature of their anatomical development; second, in the surgical manifestations which they, by their presence in the abdomen, produce. As the essayist stated, Rokitansky first described chyle cysts as dilatations of lymph ducts in the mesentery by some form of occlusion. His teachings have maintained that position until within the last fifteen or twenty years. Since, however, numerous investigations have been made by pathologists and observations by clinicians, the question is very much in doubt as to whether this statement is true, that the chyle cysts develop from obstruction of chyle ducts. Experimentally pathologists have endeavored to cause them by intentional obstruction of chyle lymph channels. It has been impossible to produce them by this means.

Ten cases have been reported by Dowd in an article on the same subject, published in 1900, in which mechanical occlusion by inflammation, by injury, by traumatism of the larger branches of the common chyle duct, or of the duct itself, was proven, and yet such cysts have not followed. Moreover, a more careful histological investigation by the expert of the lining of these cysts has shown some very disturbing factors as to their origin. For example, a case of Da Costa showed a bilocular cyst, one containing all the recognized characteristics of chyle, both chemical and microscopical, the other containing a perfectly clear translucent fluid, not at all chylous in character. Some of the cysts have had an epithelial lining, some have not. Given a single case with an epithelial lining, as was shown by Demon, and yet containing chyle, it is impossible to say all chyle cysts are of dilated chyle duct origin, because the chyle duct has not contained epithelium of that type.

Pagenstecher has reported a case, in which, in flat epithelially lined cysts there were degenerated flat epithelial cells in abundance; likewise mucus was found with the chyle in contents of cyst.

Chyle cysts of the multilocular type have occurred, one of the cysts being chylous and the other being purely serous or hæmorrhagic in the character of the cyst contents.

Interesting to the surgeon are the cases that have been reported in the last ten years, because they have caused acute symptoms of intestinal obstruction requiring immediate operative interference, the nature of the obstruction only being revealed when a laparotomy was done. Coley, of New York, has reported a case within the last two years in which the dissection of the cyst from the intestine relieved the intestinal obstruction symptoms, and resulted in a cure.

Miles F. Porter, of Fort Wayne, Indiana, has likewise had a case of volvulus which had a cyst in the mesentery of the twisted portion of the intestine.

Another argument offered by those who have effected a cure by stitching the chyle cyst wall to the integument and draining after the method of Bergmann is found in the fact that if it were an obstructed chyle duct, there should remain a fistulous opening through which the chyle could discharge, but that is not the case. It effects a cure. Chyle does not reaccumulate, the operation does not have to be repeated.

I agree with the essayist, too, that the statistics as to the mortality of the operation should be very markedly revised. The mortality certainty by extirpation should be much lower now than forty per cent, as reported by Coley.

At one of the last meetings at which our lamented Ferguson took part, namely, a meeting of the American Association of Obstetricians and Gynecologists, held in Indianapolis, he rose to state that the rarity of these cysts ought to be emphasized because in all of the laparotomies he had ever made he had never seen one. I wish to class myself in the same category. I never have had a chylous cyst of the mesentery to deal with. Up to the present time the number of cases in the literature is about 152.

BOOK REVIEWS

OBSTETRICS. The Practical Medicine Series, Vol. V. Edited by J. B. DeLee, M. D. Chicago: The Year Book Publishers, 1911.

The general practitioner, for whom these books are primarily published, will find in a condensed, but, nevertheless, comprehensive form many new obstetrical problems of practical value. The chapter on pyelitis of pregnancy, while containing nothing new, is treated according to its importance, rather broadly. It is interesting to note the statistics of pregnancy following nephrectomy. Some new methods to determine the duration of pregnancy are given, also the results of thyroidin in vomiting of the pregnant. Valuable is the chapter on extrauterine gestation and also the chapter on the importance of determining blood pressure in toxæmia of pregnancy. The chapters on eclampsia and the treatment of this condition according to Ptroganoff and also the treatment and different results obtained with different therapeutic measures in placenta prævia are well written. Considerable space is given to the different methods of relieving pain in normal labor, and the postpartum hæmorrhage. Several times, but not too often, the all-important, sharp differentiation between atony and laceration is mentioned. Momburg's treatment with all the pros and contras is well described. The chapter devoted to Cæsarean section is handled broadly and contains many good suggestions from the author's own experience. Postmortem Cæsarean section is given due consideration.

In the chapter on early rising after labor, the author gives the opinion and statistics of the foremost authors as well as his own. The warning for instrumental perforation of the uterus cannot come too often. Advice as to the proper treatment of the abdominal wall after delivery, the different ways of treating puerperal fever, the dechloridation as a treatment of habitual death of the fœtus and the use of normal blood serum as a curative agent in hemophilia ulonatorum are only a few of the very valuable suggestions and excerpts from the literature in the fourth part of the book. In reading this volume one reviews the most important questions of obstetrics. HELIODOR SCHILLER.

APPLIED ANATOMY. By Gwilym G. Davis, M. D. Philadelphia and London: J. B. Lippincott Company, 1911.

The author states that the object of this work is not to teach plain anatomical facts but to show the relation of structure to function, whether it is normal function or function disturbed or impaired by injury or disease. It is explanatory and utilitarian in character and not encyclopedic.

In considering the subject, after a few general remarks on the part involved, the skeleton and muscles are briefly described, thereby enabling one to understand the surface anatomy which immediately follows. Then comes a consideration of the various affections of the part with such allusion to the nerves and vessels as is desirable to elucidate the subject. As the book is not intended to be a systematic treatise on anatomy, such anatomical facts as cannot be shown to be useful in practice are not mentioned.

The clinical material, except where otherwise stated, is from the author's own experience. Most of the illustrations are from original drawings of preparations made by the author and his assistants.

Typographically the book is up to the usual standard of the publishers, the J. B. Lippincott Company, the illustrations are numerous and clear and the presswork excellent.

THE GROWTH OF BONE. Observations on Osteogenesis. An Experimental Inquiry into the Development and Reproduction of Diaphyseal Bone. By Sir William Macewen, M. D., F. R. S. Glasgow: James Maclehose, 1912.

This series of experiments, mostly upon dogs, was undertaken to confirm or disprove the physiological teaching, i. e., that all periosteum produces bone, that diaphyseal bone cannot be reproduced without periosteum, and that once being produced it would die were the periosteum removed. These experiments show that many of the theories of bone reproduction are fallacious.

Chapter I is a study of the genesis of the osteoblast and its development in epiphyseal cartilage, in interstitial growth, in periosteum, and in the production of bone in acute osteomyelitis.

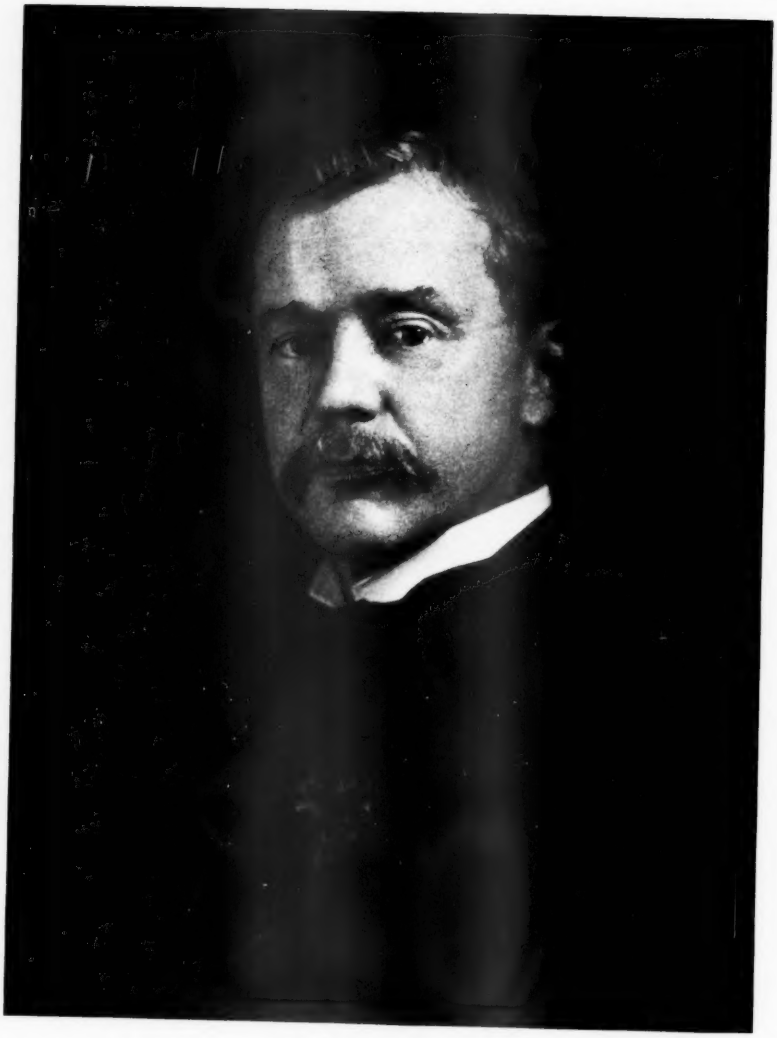
Chapter II deals with the periosteum and its inherent osteogenic power.

In Chapter III many experiments dealing with osteogenic power of bone bereft of periosteum are reported.

Chapter IV is given to bone grafting, using bone chips, bone dust, bone *en masse*, etc. A number of excellent skiagraphs, taken many years after operation on the human subject, are shown in support of the author's views.

Chapter VI is devoted to the author's conclusions based upon his experimental and clinical work.

Along with the text are sixty-one excellent illustrations of tissues in the various stages of the reparative process. H. A. POTTS.



Howard A. Kelly